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PREPARATION of FRESH TOMATOES FOR MARKET



THE TOMATO, which in the early part of the last century was regarded with suspicion and was said to be poisonous, has now become one of the most important of our vegetable crops. Potatoes and sweetpotatoes are the only two vegetable crops that exceed the tomato crop in farm value. During the last 10 years the farm value of the tomato crop in the United States has averaged more than \$40,000,000 annually.

During the last 5 years, 1931-35, an average of nearly a half million acres has been devoted annually to the production of tomatoes in the United States. Approximately one-third of this acreage has been used for growing tomatoes for the fresh market, the remaining two-thirds of the crop being produced for canning and manufacture into tomato products. Production for the fresh market has averaged about 17,000,000 bushels annually during the same period.

Tomatoes are highly perishable. The utmost care is necessary in the harvesting, handling, sorting, and packing operations if severe losses are to be avoided when they arrive in the markets.

Much progress has been made in the methods of preparing tomatoes for market. This bulletin describes the practices that are successfully used and gives information and suggestions to growers and shippers for improving their own methods.

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PREPARATION OF FRESH TOMATOES FOR MARKET

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AREAS OF PRODUCTION

FRESH TOMATOES are produced in all of the States, but commercial production for market is confined to about 13 important producing States. Approximately 275,000 growers produce these tomatoes commercially. Probably 110,000 are producers of tomatoes for the fresh market. The others grow tomatoes for canning and manufacturing into tomato products.

The bulk of the carlot movement of fresh-market tomatoes originates in five States. Out of a total of 23,228 cars shipped in 1935, Florida, California, Texas, Mississippi, and Tennessee shipped nearly 22,000 cars. Table 1 shows the number of carlot shipments of tomatoes from leading shipping States for the 10 years 1926-35, and table 2 shows the monthly carlot movement in the United States for the same period.

¹ Acknowledgment is made of the assistance rendered by field representatives of the Department and State marketing officials who supplied specific information relating to various producing areas for use in this publication. The first edition of this bulletin was issued by the Bureau of Agricultural Economics. It was written by F. Earl Parsons, who resigned June 30, 1922. This edition is reprinted by the Agricultural Marketing Service to which Mr. Spangler and the work on which the bulletin is based were transferred in July 1939.

It was estimated that about half the crop of fresh tomatoes produced in the United States in 1935 was transported to market by motortruck. Motortruck shipments largely originate in other important producing States which include New Jersey, New York, Illinois, Indiana, Ohio, Maryland, Missouri, and Arkansas. In the last few years the rail movement to market of tomatoes from many of these States has been rapidly decreasing and truck shipments have correspondingly increased. For example, in 1926, 2,006 cars were reported as moving to market from New Jersey railroad shipping points; in 1931, 52 cars were shipped by rail; and in 1935 only 8 cars were reported as moving by rail. Evidently the motortruck has almost completely supplanted the rail method of transportation in that State.

Fortunately the differing climates in the United States enable consumers to enjoy fresh tomatoes every month of the year.

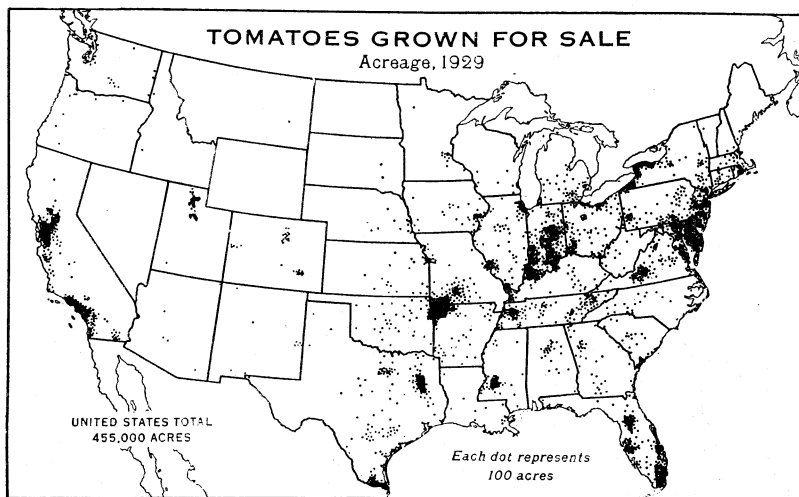


FIGURE 1.—Most of the fresh tomatoes for market are produced in Florida, Mississippi, Texas, California, Missouri, Arkansas, Tennessee, Illinois, Indiana, Ohio, Maryland, New Jersey, and New York.

Florida is the principal source of supply for fresh market tomatoes during the late fall, the winter, and the spring months. Texas also produces some tomatoes for the late-fall market but the bulk of the crop is marketed during May and June in competition with other second-early producing States. Supplies in the winter and spring months are supplemented by importations from Cuba and Mexico and to some extent by production in greenhouses principally in the East North Central, Middle Atlantic, and southern New England States. The east coast section in Florida is the most important producing section in the State. The area devoted to the production of tomatoes extends north and south of Miami in Palm Beach, Broward, and Dade Counties. The towns of Homestead, Perrine, Dania, and Canal Point are the leading shipping points. On the west coast there are important producing areas in Collier and Manatee Counties in which Immokalee, Naples, and Palmetto are well-known loading

stations. There is some production in the vicinity of Webster in Sumpter County.

TABLE 1.—*Carlot shipments of tomatoes from leading shipping States, calendar years 1926-35*¹

State	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	10-year average
Florida.....	4,332	10,055	8,668	7,593	6,974	5,250	6,275	6,290	7,817	7,067	7,032
Texas.....	2,883	3,407	4,435	5,339	7,538	8,779	4,111	6,341	6,040	4,810	5,368
California.....	4,441	4,620	4,475	4,240	5,459	3,403	4,305	3,729	3,660	3,162	4,149
Mississippi.....	3,492	4,849	3,230	4,069	3,451	2,683	2,869	2,408	3,012	2,355	3,245
Tennessee.....	2,374	2,016	2,759	2,317	2,496	2,038	2,026	1,429	1,702	2,170	2,133
Ohio.....	1,065	1,125	926	1,020	1,007	1,360	960	679	625	835	960
New York.....	656	951	1,112	838	514	774	463	408	564	510	679
Utah.....	272	883	899	740	342	323	198	282	337	276	455
Maryland.....	259	586	613	775	554	373	313	267	267	361	437
South Carolina.....	449	187	161	348	461	348	235	162	153	604	311
Indiana.....	1,514	1,132	799	1,631	2,217	683	279	148	28	77	851
Arkansas.....	281	240	389	300	318	217	228	62	92	208	234
Illinois.....	422	270	240	237	316	339	139	53	60	2	208
North Carolina.....	12	21	3	2	118	158	162	83	66	79	70
Virginia.....	454	360	277	488	243	166	147	61	83	46	233
Washington.....	35	95	143	215	336	252	78	100	142	31	143
Colorado.....	27	20	59	55	138	195	67	30	53	25	67
New Jersey.....	2,006	1,329	678	694	842	52	17	11	5	8	564

¹ Compiled from daily and monthly reports received by the Bureau of Agricultural Economics* from officials and local agents of common carriers throughout the country. Shipments as shown in carlots include those by boat reduced to carlot basis. Shipments by motortruck are not included.

TABLE 2.—*Monthly carlot shipments of tomatoes, 1926-35*¹

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1926.....	14	54	297	1,144	2,987	7,067	4,417	1,736	4,779	2,681	731	136	26,043
1927.....	78	427	2,154	3,628	6,157	6,478	2,898	1,597	4,518	3,912	797	352	32,996
1928.....	492	300	532	2,109	5,117	8,049	4,366	1,967	3,773	2,368	1,036	463	30,572
1929.....	587	1,235	1,589	2,001	4,614	7,708	4,114	1,845	3,818	2,949	1,122	175	31,757
1930.....	178	638	1,379	1,446	5,808	8,763	4,317	1,462	4,649	3,753	1,087	570	34,050
1931.....	398	457	562	538	5,339	9,267	3,978	1,153	2,552	2,195	1,774	453	27,666
1932.....	561	910	1,890	1,541	2,130	6,885	2,931	784	1,538	2,353	1,258	418	23,199
1933.....	610	1,059	1,824	2,155	3,358	6,407	1,904	550	1,390	2,143	1,049	536	22,985
1934.....	773	1,114	1,955	2,100	4,448	7,150	2,239	712	1,451	1,840	1,029	429	25,240
1935.....	36	16	1,119	3,734	4,401	5,943	2,738	580	1,674	2,079	478	438	23,236

¹ Compiled from daily and monthly reports received by the Bureau of Agricultural Economics* from officials and local agents of common carriers throughout the country. Shipments as shown in carlots include those by boat reduced to carlot basis. Shipments by motortruck are not included.

During June most of the fresh tomatoes are supplied by the secondarily group of States in which Texas and Mississippi are the most important. Also Tennessee, classed as an intermediate producing State, usually markets several hundred cars during this month. Georgia, Louisiana, and South Carolina ship some tomatoes at this time. The lower Rio Grande Valley is the principal tomato-producing section in Texas although in recent years production has spread considerably over practically all of the eastern part of the State from the Rio Grande to the Red River. The Yoakum district, Groveton-Livingston-Jasper district, Jacksonville district, and the Red River district are recognized as the four leading producing areas in eastern Texas. In Mississippi the tomato-producing industry is located to the south and southwest of Jackson. Copiah County is the largest producing county, and Crystal Springs and Hazelnurst are the leading shipping points.

*Since July 1939 the reports on shipments have been received by the Agricultural Marketing Service.

Early and midsummer supplies of fresh tomatoes come from the intermediate producing States. They include Arkansas, Maryland, Missouri, New Jersey, North Carolina, Tennessee, and Virginia, and parts of California, Ohio, and Illinois. Swedesboro, Glassboro, and Hightstown are outstanding distributing points for New Jersey fresh tomatoes. Tomato production in Tennessee is largely confined to Gibson County where Milan and Humboldt are the chief loading points. The Marietta district in southeastern Ohio furnishes a considerable supply of fresh tomatoes in late June and early July. In southern Illinois, Cobden and Anna are the principal loading points. The Eastern Shore is the most important producing section in Maryland although production is more or less scattered over all sections of the State, while in North Carolina shipments largely come from Bertie, Scotland, and Washington Counties.

In Missouri, tomatoes are produced principally near St. Louis and in the southwestern part of the State, while in Arkansas production is largely confined to six counties in the northwestern part. There is some commercial production in a number of the southwestern counties.

Tomato shipments from California usually begin in May from the Imperial Valley and continue from other sections until December. Therefore, parts of the State are called early, intermediate, and late. The comparatively important producing areas include Los Angeles, Ventura, and Santa Barbara Counties in the southern district, the Bay section to the south of San Francisco and Contra Costa County in the central district and the Sacramento section in the northern district. Important shipping centers in California include Los Angeles, Moorpark, Santa Maria, Guadalupe, Chualar, Salinas, Centerville, San Leandro, Knightsen, Brentwood, and Sacramento.

Plentiful supplies of fresh tomatoes are usually furnished from midsummer to frost by a large number of late-producing States. The bulk of the carlot shipments during this period come from California, New York, northern Ohio, and Utah, but large supplies are also available near the large market centers in most of the North Central and Northern States except in the Northeast. Most of the tomatoes produced in these Northern States are transported to market by motortruck.

STAKING AND PRUNING AS RELATED TO MARKET QUALITY

Two general systems of production are practiced in the various tomato-producing sections of the country. In one, the plant is allowed to develop naturally, spreading out and falling upon the ground as it develops. This is the usual practice throughout most of the producing sections in California, Florida, New Jersey, New York, Utah, and Illinois, and the lower Rio Grande Valley of Texas. In the other system, the plant is allowed to develop one, two, or three stems, the number depending on the grower's estimate of the soil fertility. The stems are loosely tied to a stake driven beside each plant. As the plant grows additional tyings are made and all side branches are cut or pinched out as they appear at the base of the plant or in the axils of the leaves.² Staking is the general practice in most

² Farmers' Bulletin 1338, Tomatoes as a Truck Crop.

of the tomato-producing areas of Mississippi, Tennessee, Louisiana, east Texas, parts of Indiana and Oregon, and the Palmetto section of Florida. The practices of pruning and pinching back vary in these different sections. In east Texas and Mississippi the top of the plant is pinched out after four or five good clusters of fruit have been formed. Staked plants are allowed to develop normally in Tennessee and near St. Louis, Missouri.

Some growers in the Northeastern States follow a practice known as "leaf pruning." The purpose is to stimulate the early formation of the branches and the setting of a large number of fruit clusters. All the leaf except the inner two lobes or segments are pruned away when the plants are from 6 to 9 inches in height. After the branches have started no further pruning is practiced and the plants are left to grow and spread on the ground naturally.

Growers of greenhouse tomatoes usually follow the single-stem system of pruning and training tomato plants although some growers train the vines to two or three stems.³ Any shoots arising from the leaf axils are removed to throw all of the energy of the plant to the main stem. The plants are supported either by heavy twine running from the base of the plant to an overhead attachment or by stakes driven by the side of each plant. Soft twine is used to tie the plants to the supporting twine or stake.

Some tomatoes on the first formed or lowest clusters are often rough, ridged, or ill-shaped and are unsuitable for slicing purposes because of the large proportion of the fruit wasted in preparing it for use. Likewise, tomatoes produced on the top clusters are often not satisfactory from the market standpoint, because of small size and lack of firmness. Tomatoes in the top clusters are often sunburned, or they show subnormal color when ripe because of the depletion of plant foliage and weakened vitality of the vine during the latter part of the season. Rough or ill-shaped specimens from bottom clusters and thin-walled, unattractive tomatoes from top clusters are of inferior quality from the standpoint of appearance and shipping quality and should be sorted out from normal-shaped, firm, and meaty fruit before being packed for distant shipment.

COMMERCIAL VARIETIES

The choice of varieties is an important factor in successful tomato production. In the old established tomato-growing sections the varieties that are best adapted to each particular section have been well demonstrated. Growers should therefore confine production to those varieties which are adapted to their section and possess the most desirable market qualities. Those varieties which produce fruit that is medium in size, smooth, and well-shaped will prove the most satisfactory from the market standpoint. Tomatoes larger than $3\frac{1}{4}$ inches in diameter are often badly ridged over the shoulders or are otherwise misshapen and will seldom command as high a price as those that range from $2\frac{1}{4}$ to $3\frac{1}{4}$ inches in diameter.

It is important that varieties should not be mixed, especially those that have different shades of red color when ripened. In some sections where several main-crop varieties are produced there is a tendency to

³ Farmers' Bulletin 1431, Greenhouse Tomatoes.

disregard variety when packing tomatoes for shipment. These sections ordinarily ship their stock in the green stage at which time difference in color is not apparent. After such a lot ripens, however, a mixture of yellow-red and purplish-red varieties in the same container is very noticeable and the unattractive appearance is likely to be reflected in the selling price. A mixture of varieties is not so objectionable if the stock is similarly shaped and develops the same shade of color when ripened.

Although many varieties of tomatoes are grown in the United States only a few are commercially important. It is conservatively estimated that nine varieties include 85 or 90 percent of all the tomatoes grown in the country.⁴ They are Earliana, Bonny Best, Gulf State Market, Globe, Marglobe, Early Detroit, Greater Baltimore, Stone, and Santa Clara. The three last-named varieties are more extensively used for canning purposes than for shipping as fresh market tomatoes.

In recent years the Marglobe and Gulf State Market varieties have become the most popular in the southern producing States although Globe, Acme, Beauty, and Early Detroit are frequently grown. The Marglobe variety has proved to be one of the most resistant to disease. It is a prolific producer and the fruit is generally well shaped, firm, and meaty and possesses excellent shipping qualities. The Globe is still produced extensively in Florida and in Texas; Clark Early, Pritchard, and Livingston Globe are next in importance to the Gulf State Market variety.

The Stone, for many years the leading market variety in California, has been replaced by Marglobe although it is still popular along with Martin Stone and Jack of Hearts. The Marglobe has become a leading variety in some of the North Central and Eastern States particularly Illinois, Ohio, New York, Maryland, and New Jersey. Other popular varieties grown in these States are Bonny Best, John Baer, Earliana, Break O'Day, and Pritchard.

Many other varieties of tomatoes are produced to a limited extent in the various producing sections of the country. However, careful buyers may discriminate against these little-known varieties which may be less desirable in shape, color, and shipping qualities than the better known and thoroughly tried varieties.

HARVESTING

Tomatoes grown under the best of conditions are highly perishable and should be harvested and packed as rapidly as consistent with careful handling practices. In the green stage they seem firm and will apparently stand a considerable amount of rough handling, but the damage becomes apparent in the markets after the fruit has ripened. Abrasions or bruises that are scarcely noticeable on a mature-green fruit are likely to appear as dark-brown or black unsightly spots at the market. Bruises and mechanically injured areas also provide an easy entrance for disease organisms and every effort should be directed toward lessening the opportunity for such infection. In many sections harvesting is done by laborers who are indifferent to these points. Even some well-informed growers and

⁴ U. S. Department of Agriculture Miscellaneous Publication No. 160, Description of Types of Principal American Varieties of Tomatoes.

shippers often fail to give proper attention to the maintenance of a high-quality product. In their effort to handle a large acreage they overlook the fact that profits often depend more upon quality than upon quantity.

TIME OF PICKING

The proper stage of maturity at which tomatoes should be picked depends to a large extent on the distance from the markets. Three definite stages of maturity are recognized commercially—mature-green, pink, and ripe. Tomatoes reach a stage of maturity on the vine that will insure ripening several days before any pink or red develops on the surface. Fruit that is to be shipped long distances to market therefore is usually picked in the mature-green stage and shipped without refrigeration.

Mature-green tomatoes or “green wraps”, as they are sometimes called, comprise the bulk of the shipments from Florida and Mississippi, and a large portion of the shipments from Texas, Tennessee, California, South Carolina, Louisiana, and Utah. At this stage the tomato is almost fully grown and the interior ripening processes are well under way. The characteristic red color usually develops on some of the tomatoes during the transit period. A large percentage of green-wrap stock arrives in the markets without a trace of red color, and even when held in ripening rooms for several days at a temperature from 70° to 75° F. many tomatoes do not develop normal color. Usually the fault lies with the pickers who, in depending on size as the principal indication of maturity, pick the fruit before it is sufficiently developed. Also there is a tendency upon the part of many shippers at the beginning of the season to ship green tomatoes before they are mature, hoping they will get top prices before tomatoes become more plentiful. Often the reverse is true and they fail to get repeat orders from a dissatisfied receiver who may have been put to great inconvenience in ripening and disposing of the shipment.

No definite rules have been established for determining the proper maturity of tomatoes for shipment in the mature-green stage. However, according to the requirements of the United States standards for fresh tomatoes a tomato is considered mature when the seed cavities have developed a jellylike or glue-like consistency and the seeds are well developed. In the practical test a sharp knife should be used and the tomato cut crosswise of the seed cells. If the pulp that surrounds the seeds has become jellylike and the seeds give way before the edge of the knife and are not cut in slicing, the tomato is considered to be mature enough to be shipped. For some varieties the presence of light color or whitish area on the blossom end of the fruit is considered a fairly reliable index of picking maturity. The size of tomato fruits is not a proper guide to the maturity, as it is the age that determines development.

The careful foreman, before issuing instructions to the picking crew, usually selects a number of tomatoes and after slicing them to determine the relation of the external characteristics to the stage of maturity, bases his instructions to the pickers on the rule that seems to apply best. It is difficult to lay down any directions that will be followed closely by the pickers as their usual tendency is to pick all

fruit that has attained a certain size. However, through close supervision and proper cooperation between the foreman in charge of the pickers and the foreman at the packing house, a large proportion of the extremely immature stock which is now received in the markets only to shrivel before attaining normal color might be left on the vines until fully developed.

At the beginning of the season vines should be picked at least once a week and after the season is well under way they should be gone over at least twice a week or preferably every other day in hot weather.

Tomatoes are picked in the pink (sometimes referred to as "turning") and ripe stages in those sections that are comparatively near to the markets. The bulk of the supplies from New Jersey, Indiana, and Ohio and a large portion of those from New York and Illinois, as well as those from other North Central, Eastern, and Northeastern States are marketed in these stages. Sending tomatoes to market by motortruck has increased the volume being marketed in these stages. Even though produced relatively near the markets, tomatoes formerly shipped by rail often did not reach consuming trade channels for 3 or 4 days after picking. With the advent of the motor-truck as a means of transportation tomatoes are now moved several hundred miles overnight and are offered to the consuming trade the following morning.

Tomatoes in the pink stage will naturally hold up longer than those picked in the ripe stage. The term "pink" is applied to tomatoes with red or pink color varying from a trace at the blossom end to a considerable amount of the surface covered. The term "ripe" indicates that most of the surface is covered with pink or red. However, the tomatoes should be firm and show no indication of softness.

Tomatoes from fields which are to be marketed in the pink and ripe stages should be picked every day or two when the ripening season is well under way. Otherwise the chances of getting soft and overripe fruit into the pack are very great.

PICKING UTENSILS

Picking utensils of many varieties are used in the various tomato-producing sections. Galvanized-iron buckets and $\frac{1}{2}$ -bushel round stave baskets equipped with wide bails for the comfort of the pickers are among the most satisfactory picking utensils now in use. Various sizes of Climax or splint baskets are popular picking containers in some sections, notably in Ohio and New York. Larger types of picking utensils are generally undesirable because pickers have a tendency to set them on the ground and toss the fruit from a considerable distance in order to avoid carrying them about from vine to vine. In New Jersey and some of the other Middle Atlantic and South Atlantic States the $\frac{5}{8}$ -bushel hamper is often provided with a handle and used for picking.

Regardless of the shape and size of picking utensils used the interiors should be inspected carefully and all sharp edges, nail points, and rough surfaces should be smoothed off. Some of the more progressive growers in California and other States recently have adopted the practice of placing corrugated paper pads or burlap in the bottom of picking containers to avoid bruising the

fruit in handling and to prevent the tomatoes from rubbing on any dirt or sand that may accumulate in the bottom of the containers. Every effort should be directed toward careful handling, for the small skin breaks, bruises, and abrasions made by sharp or rough edges, although little noticed at the time of packing, may afford an entrance for disease organisms which develop rots in transit, or may provide the basis for unsightly scars on the ripened fruit.

In a number of producing sections various sizes and types of field crates and boxes are in use. A few types are shown in figure 2. In Florida, cypress boxes of about 1 bushel capacity are the most pop-



FIGURE 2.—Three popular types of field crates. Because of its length, the lower crate is unwieldy to handle and necessitates wide trucking alleys in the packing house.

ular field containers and citrus boxes and bushel crates are used to some extent. A long and rather shallow type of field crate is used in Tennessee. This type of container is generally unsatisfactory as it is unwieldy for one man to handle and is so large that unusually wide platform trucks and trucking alleys are required in the packing houses. Both the California lug which is also used as a shipping container and a larger field crate are extensively used in California. Growers in Texas use field boxes and some bushel crates and citrus boxes as field containers. Field crates and boxes should preferably be light in weight but should be durable and equipped with cleats across the top at each end to prevent bruising the fruit in stacking. Boxes should be provided with handholes to facilitate handling.

PICKING

The grower and members of his family are usually able to pick the tomato crop when the acreage is small, but the producer of a large acreage must hire crews of pickers to work under his or his foreman's direction. Many growers pay a uniform daily wage, whereas others prefer to pay on the basis of the quantity picked. Both methods have advantages and disadvantages. Under the set daily wage system pickers are likely to follow instructions more carefully and to pick only those tomatoes that have reached the right stage of maturity. Pickers paid on the basis of the quantity picked are likely to sacrifice quality for quantity unless they are closely supervised.

In picking, the tomato should be grasped in the hand with the thumb or forefinger pressing against the stem, and should be sep-

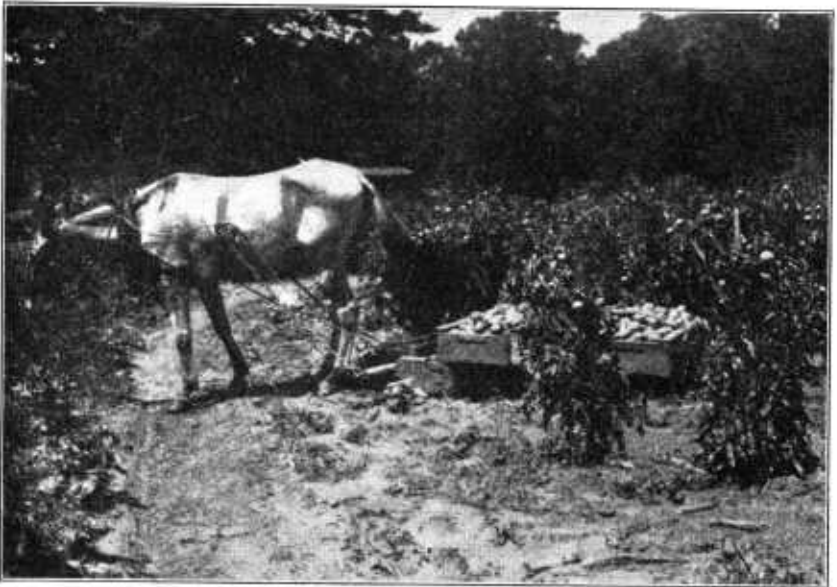


FIGURE 3.—The field crates on the sled are kept within convenient reach of the pickers.

arated from the vine by a half turn or twist. Tomatoes are easily separated from the vine even at the mature-green stage as a layer of hard-walled or corky cells develops at the union of the stem and the fruit. This layer forms on the outer rim of the stem and extends inward; after the tomato is picked it appears as a brownish ring in the stem eye. In sorting operations the width of this ring is sometimes used as an indication of the maturity of green tomatoes and specimens that show a very narrow brownish ring or have a greenish-white cast in the entire stem-eye area are discarded as being immature.

Preferably one row, or two at the most, should be assigned to each picker, so that picking containers will be within convenient reach. Care should be exercised to prevent bruising in the transfer of the fruit from the picking utensil to the field container. In dumping, the picking container should be so tilted as to permit the tomatoes to roll gently into the field container.

Short rows and a generous distribution of field containers at the roadway or ends of the rows increase the daily output by decreasing the distance the picker must carry his filled basket. Cross roadways should be made at regular intervals if the rows are exceptionally long, or if this is impracticable and the vines are staked, the field crates may be placed on a long sled and drawn between the rows (fig. 3). If the packing shed is adjacent to the field, the filled containers are hauled directly to that point. Otherwise they are left at the end of the rows and placed on a wagon or truck for hauling to the packing house.

The less progressive growers in some sections still empty tomatoes in the bottom of a wagon or truck and haul in bulk. This should never be done even though the bed of the vehicle is well padded. The rough handling in loading and unloading, together with the weight of the fruit in a deep load, results in bruising which, although it may escape the scrutiny of the sorters, seriously injures the appearance of the tomatoes after they have ripened.

Growers of greenhouse tomatoes follow a slightly different practice in picking tomatoes than growers of field-grown fruit. Instead of twisting the tomato from the vine most of the greenhouse growers clip the stem just above the calyx, thus leaving the calyx and a small portion of the stem attached to the tomato. This practice is followed in order that the tradesmen and consumers will be able to distinguish greenhouse-grown from field-grown fruit. Ripe greenhouse-grown tomatoes with the stems and calyxes attached present an attractive appearance, but unless great care is used in handling and packing some tomatoes may be punctured by the stems of other tomatoes.

FARM PACKING

Packing of fresh tomatoes on the farm by the growers is gradually giving way to packing in centralized packing houses by experienced sorters and packers. Farm packing is now largely confined to pro-



FIGURE 4.—Providing shade is the principal point considered in designing the farm packing house for tomatoes.

ducing areas in the North Central and Eastern States where the tomatoes are for the most part hauled by truck and marketed in the pink and ripe stages. In Ohio, however, it is estimated that over 50 percent of the fresh tomatoes are prepared for market in central packing houses.

Although improvement has been noted in the quality of farmers' packs in recent years there is often a wide variation in the quality of an individual grower's lots. In many cases sizing is irregular and the arrangement of the fruit in the packages is frequently uneven, loose, and unattractive.

Sorting and packing equipment on small farms is often very crude. Operations are frequently carried on in the shade of a tree or under a temporary roof made of canvas or boards supported at the corners by poles (fig. 4). Even though the shelter provided is not weather-proof there is no excuse for not providing for careful handling of the tomatoes. A waist-high packing bin about 30 inches wide, 8 inches deep, and several feet long with a wire-net bottom covered with canvas or burlap should be provided. If the bottom of the bin is made of boards it should be well padded with burlap or some other soft material. A packing bench should be constructed along one side of the bin.

CENTRAL PACKING HOUSES

A marked improvement has been evident during recent years in the quality of fresh tomatoes offered for sale in the markets. Much of this improvement can be attributed to the increased volume that is sorted and packed in central packing houses by experienced sorters and packers instead of being packed at the farm by the grower and members of his family. The bulk of the green-wrapped stock from Florida, Mississippi, Texas, California, and Tennessee, as well as that from the less important producing States, is now prepared for shipment in centralized packing houses.

Central packing houses are usually operated by the shipper but in some instances they are operated by cooperative associations or individual growers who control large acreages. Local buyers either purchase the unpacked tomatoes in field containers or arrange with the grower to act as selling agent and to market the crop on a consignment basis after making a fixed charge per package for sorting and packing. The central packing houses are largely responsible for placing a fairly well-standardized product on the markets. Usually their operations are on a scale sufficiently large to permit a division of labor and adequate supervision. The managers are in a position to maintain experienced sorters and packers who are essential to the packing of a uniform and high-quality product.

LOCATION

In producing sections where the crop is to be shipped by rail it is preferable that the packing house be located alongside the track or spur track. Many tomato packing houses are so located, in or near small towns and villages. Packed fruit can be loaded directly into the cars and packing-house employees need not be transported to the packing house.

Locating the packing house on a railroad siding is not always feasible if the producing section is located some distance from the railroad. Under such conditions it may be best to locate the packing house close to the fields and transport the packed fruit by truck to the railroad. In transporting there is likely to be less injury to fruit packed in containers for shipment than to unpacked fruit in field crates.

CONSTRUCTION

Most of the tomato packing houses are rectangular-shaped frame or galvanized-iron buildings of various dimensions, usually from 35 to 50 feet wide and 60 to 150 feet long (fig. 5). Some are one story and others are two stories high. The penthouse type of construction is often employed in the two-story buildings. In the two-story houses the upper story or loft is generally used for the construction and storage of lug boxes which are supplied to the packers on the lower floors by means of slides or chutes. The lower floor should prefer-



FIGURE 5.—Interior arrangement of a typical California tomato packing house. Stacks of fruit in the field containers as received from the growers are shown in the background. Packing bins and packers' benches are shown in the foreground.

ably be constructed at approximately the same height as a truck or wagon bed, or the floors of refrigerator cars if the house is on a railroad siding. In many instances covered platforms materially enlarge the protected area for storage purposes but have the disadvantage of shutting off the light from the interior of the house.

Regardless of size or capacity the well-constructed packing house should provide for adequate ventilation, good light, and ample storage space. Good ventilation is essential because most tomatoes are packed during warm weather. If the packing space is not enclosed or if large sliding doors and windows are provided the problem of ventilation is relatively simple. Circulation of air may be increased by providing slatted floors, but as they are not easy to truck over, a better arrangement is to provide solid floors in the trucking alleys and slatted floors over the storage space.

An abundance of light is needed for the sorting operations, because such defects as immaturity, worm injury, and certain types of disease do not show conspicuously on the green or red surface of the tomato when the fruit is in shadow. The method of providing illumination depends on the interior arrangement of the house. Where the sorting and packing operations are performed along the side or end of the building, sliding doors or high windows may be placed along the side walls, but with this arrangement some of the workers are likely to stand in their own light. Some packing-house managers prefer to carry on the sorting and packing operations in the central portion of the house. This is generally satisfactory if the sorting and packing bins are amply lighted by artificial light or if large skylights or windows in a penthouse type of roof are provided. In the latter type of construction the penthouse structure should be at least 10 feet in height. In houses provided with lofts for the storage of crate material and lug boxes, shafts or walls are sometimes used to admit light and concentrate it directly over the sorting tables. The interior of these shafts should be painted white to intensify the illumination.

PACKAGES

The most suitable package to be used in marketing fresh tomatoes depends largely on the method of transportation to market, the stage of maturity at which the tomatoes are marketed, relative costs of the packages, market preferences, and the kind of labor available. The California lug box has become the most popular package for carload shipments of green-wrap stock. Other packages of minor importance from the national standpoint, but of considerable importance in local producing districts, are the 12-quart Climax basket, the New Jersey 20-quart crate, the western peach box, the four-basket flat, the six-basket carrier, the $\frac{5}{8}$ -bushel hamper, the $\frac{1}{2}$ -bushel and 1-bushel round stave basket, the 8-quart corrugated fiberboard basket, the 8-quart square-braid splint basket, the 20-pound lug, and the four-basket straight-sided crate.

THE CALIFORNIA LUG BOX

The California lug box shown in figure 6 has practically displaced all other types of packages for the shipment of green-wrap tomatoes in carload lots. The bulk of the shipments of mature-green tomatoes from California, Florida, Texas, Mississippi, Tennessee, Utah, South Carolina, Louisiana, New York, Oregon, and Washington now arrive in the markets in this package. Its standard dimensions are $13\frac{1}{2}$ inches wide by $16\frac{1}{3}$ inches long by $5\frac{3}{4}$ inches deep, inside measurements. A cleat eleven-sixteenths of an inch thick is used at each end of the lug to protect the tomatoes from pressure by the lid. Some shippers prefer to use narrow cleats of the same widths as the end pieces of the lug while others use cleats wider than the end pieces. Wide cleats are often rounded at the inside lower corner to prevent cutting and bruising of the fruit. Although the above dimensions of the package and cleat are given as standard, lugs of slightly different dimensions are sometimes used in some sections.

When the lug is substantially constructed the rectangular and regular shape permits easy loading in the cars. It is designed to hold three layers of medium- or large-sized tomatoes which weigh about 30 pounds net.

The use of the lug has encouraged more careful sorting and sizing of the fruit than is commonly practiced when the fruit is packed without any order of arrangement. Each tomato is handled separately by the packers. The definite arrangement of the fruit within the lug contributes to its attractiveness and minimizes the danger of bruising.

The lug pack is more expensive than most other types because the services of experienced packers are necessary to insure properly packed lugs. General overhead for packing is also higher because this type of pack is prepared almost exclusively in central packing houses. Considerable volume is essential to insure profitable operation of the packing house where the lug pack is employed.

THE 12-QUART CLIMAX BASKET

The 12-quart Climax basket shown in figure 7 is favored by producers in Ohio and Indiana and is used in several other States including New Jersey, New York, and Illinois. The tomatoes marketed in this



FIGURE 7.—The Climax basket of 12 quarts capacity is a neat package of convenient size which consumers like. It is the most popular package used in southeastern Ohio, and is used to a lesser extent in many other northern sections.

rough handling. Some tomatoes in this package are transported to market by rail but the bulk of the shipments are now made by motortruck.

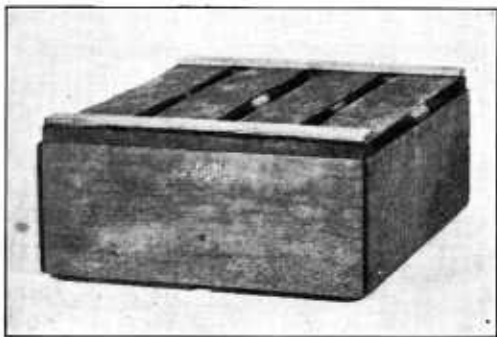


FIGURE 6.—The California lug box now used almost exclusively for carlot shipments of green-wrap tomatoes.

container are usually picked in the pink or ripe stages. The package is readily prepared by inexperienced packers and is a convenient and popular size for sales in the original package direct to consumers. Although the tomatoes are protected by a slatted cover the packages must be handled carefully to minimize damage to the contents. As the baskets are somewhat flexible, bruising and cutting may result from undue pressure or

THE NEW JERSEY 20-QUART CRATE

Because of the demands of the receiving trade for a smaller type of package, the New Jersey 20-quart crate (fig. 8) is becoming less popular. There are some variations in the dimensions of this package but representative measurements are $6\frac{3}{4}$ by 11 by $18\frac{3}{8}$ inches inside. A peculiar feature of this package is the raised central portion of the top which would prevent stacking were it not for the bottom rails. It is usually made of unfinished lumber and presents rather an unattractive appearance in the markets. It is strongly made but its large capacity is often a disadvantage since the weight of the fruit in a package of this depth frequently causes crushing and leaking of ripe tomatoes in the bottom



FIGURE 8.—The New Jersey 20-quart crate.

of the crate. Retailers in some markets repack the tomatoes into splint, Climax, or till baskets before displaying them for sale.

THE WESTERN PEACH BOX

The western peach box is used to some extent in Washington and Oregon as a container for pink and ripe tomatoes packed for nearby markets. This container, which is $11\frac{1}{2}$ inches wide, 18 inches long, and 4 inches deep, is strongly built and convenient to handle.

THE FOUR-BASKET FLAT

The four-basket tapered-end flat shown in figure 9 was formerly very popular in Mississippi and Texas and was used quite extensively in Tennessee and Missouri but its use in these States has been largely supplanted by the California lug. Illinois is the only State where this package is now important, but even in this State its popularity is declining. It is used to a minor extent in Texas for express shipments. The crate is $4\frac{1}{2}$ inches deep, $13\frac{1}{2}$ inches wide at the top, $11\frac{1}{2}$ inches wide at the bottom (inside), and has an outside length of 22 inches. A center head is used, giving two compartments each $10\frac{5}{32}$ inches long inside. It contains four 3-quart oblong till baskets and as they are small any damage from an occasionally decayed or leaky tomato is confined to a relatively small quantity of stock.

THE SIX-BASKET CARRIER

The popularity of the six-basket carrier (fig. 9) has seriously declined in recent years. At one time it was used for practically all of the Florida shipments and a considerable part of those from Tennessee, Texas, and Mississippi. The California lug has taken the place of this container except for occasional shipments from Florida, South Carolina, and possibly a few other States. The carrier holds six 4-quart oblong till baskets and these relatively small subcontainers reduce the opportunity for crushing the fruit in transit. But it is not a suitable package for farm packing as the necessary

uniform sizing of the fruit in the various layers of the baskets and the system of arrangement in the tills require that the operation be performed by experienced workers under close supervision. The

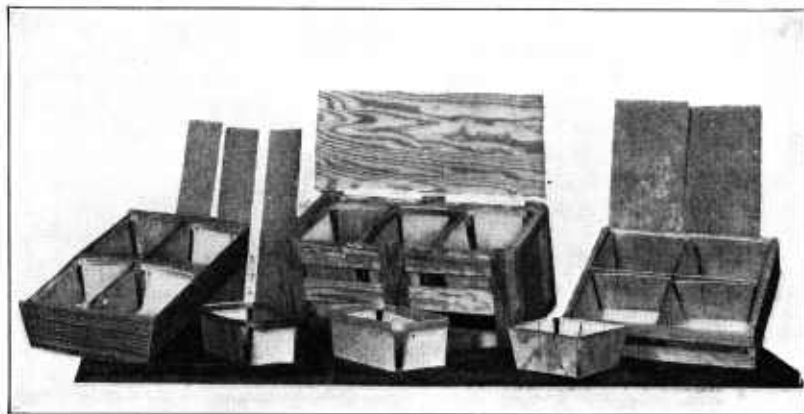


FIGURE 9.—Crates used for tomatoes. Left, four-basket flat used in Illinois. Center, six-basket carrier formerly very popular in Florida, Texas, Mississippi, and Tennessee but now used only for occasional shipments and for repacking in some markets. Right, western four-basket, straight-sided crate used in California for early local shipments.

tills are used by some dealers in eastern markets for repacking tomatoes from other larger containers such as $\frac{5}{8}$ -bushel hampers or bushel round stave baskets.

THE $\frac{5}{8}$ -BUSHEL HAMPER

The $\frac{5}{8}$ -bushel hamper in addition to being used extensively throughout the Eastern and East North Central States as a picking container and for transporting tomatoes to canneries is commonly used for carrying pink or ripe tomatoes to market by motor-truck, particularly from points in Pennsylvania and New Jersey to the Philadelphia market. Care must be used in filling the hamper because some tomatoes are sure to be crushed if the package is overfilled.

ROUND STAVE BASKETS

Round stave baskets usually of $\frac{1}{2}$ -bushel or 1-bushel capacity are used to some extent as containers for transporting pink or ripe tomatoes to local markets in the Eastern and East North Central States. They have the same disadvantage as other packages of considerable depth in that the weight of the fruit may crush some of the ripe tomatoes in the bottom of the packages.

FIBERBOARD AND SPLINT BASKETS

Fiberboard and square-braid splint baskets of 8-quart capacity shown in figure 10 are popular containers for fresh tomatoes in Ohio and Indiana. Fiberboard baskets have recently been introduced in the Sterling section of Illinois. They have been used

extensively for a number of years for greenhouse-grown tomatoes in these States and their use is gradually being extended to the field-grown crop. Because of their small size and convenient handles

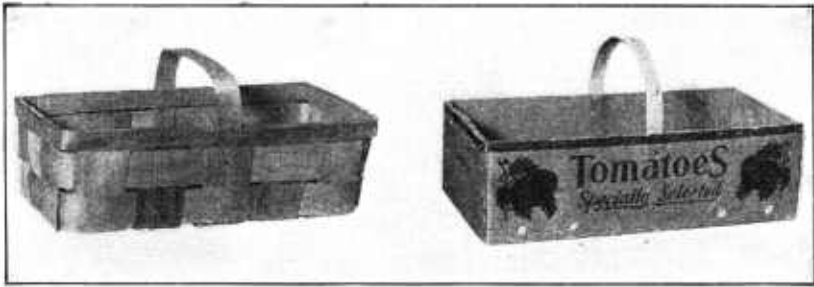


FIGURE 10.—Popular types of 8-quart square-braid splint and fiberboard baskets used for field-grown and greenhouse tomatoes in some producing sections of the East North Central States. These baskets when filled are lidded with closely fitting fiberboard covers.

these packages are adapted for sale to consumers without disturbing the contents. The fiberboard basket also lends itself to the stamping of brands and other information in attractive colors.

THE 20-POUND LUG

The 20-pound lug, also known as the Sterling lug, was first used in the vicinity of Sterling, Ill., but its use has been extended to the tomato-producing sections in southern Illinois where it is next in importance to the four-basket flat. The standard dimensions are $4\frac{1}{2}$ inches by $11\frac{1}{2}$ inches by $18\frac{5}{8}$ inches, inside measurements, but various box manufacturers have varied these measurements somewhat. This package has proven to be satisfactory in this section where packing of the pink or ripe tomatoes is done at the farm by the producer.

THE FOUR-BASKET STRAIGHT-SIDED CRATE

The four-basket straight-sided crate (fig. 9) is used in some sections of California for early local shipments of tomatoes. It holds four square metal-rim baskets, containing 3 quarts or approximately 5 pounds each. This crate should not be confused with the four-basket flat which is popular in Illinois.

PACKING EQUIPMENT

SORTING AND PACKING BINS

Most of the fresh tomatoes produced are sorted and sized by hand. For this reason packing-house equipment need not be so elaborate as for many products for which complicated grading and sizing machinery has been developed.

Where hand sorting and sizing is practiced the packing and sorting bins are the most important pieces of equipment. Packing bins should be so designed that all of the tomatoes in the bin are within convenient reach of the packers. It should not be necessary for the packer to rake or pull the fruit toward him. A very satisfactory

design for packing and sorting bins is illustrated in figure 11. The packing bins should be about 6 inches deep at the back, 30 to 36 inches wide, and 36 to 48 inches from back to front, depending on the pitch of the bin floor toward the packer. The bottom of the bin is usually made of wire netting of about 1-inch mesh, stretched tightly and covered with burlap or canvas. The number of bins needed will depend on the volume of tomatoes handled. In some instances specially constructed bins have been installed which have movable bottoms hinged at the upper or the sorter's side and supported by coil springs at the packer's side. As the fruit is removed,

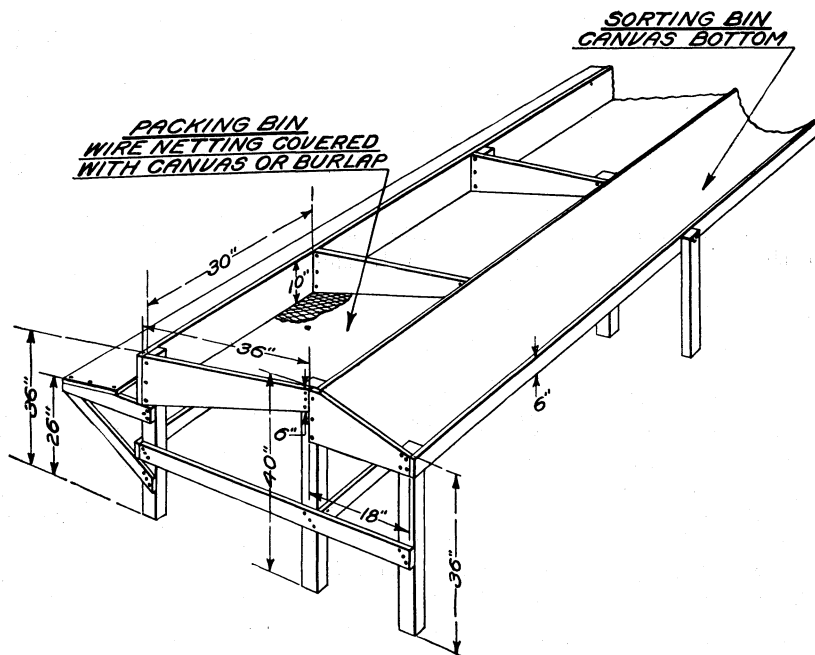


FIGURE 11.—Type of sorting and packing bin in general use where sorting is done after the field crates are emptied into a sorting bin.

the bottom of the bin is raised so that a supply is always within easy reach of the packer.

If a sorting bin like the one illustrated in figure 11 is used it should be about 18 inches wide and 6 inches deep. The bottom of the sorting bin should be made of canvas or burlap, similar to the bottom of the packing bins. If the tomatoes are to be sorted directly from the field containers, a bench can be attached to the sorter's side of the packing bins.

SIZING MACHINES

Tomato shippers have been experimenting for a number of years with various types of machines to size tomatoes mechanically. Most of the machines tried out have been discarded because they caused excessive mechanical injury to the fruit. A sizing machine of the type employed for apples is used to some extent for sizing tomatoes. Figure 12 illustrates another type that is used rather extensively.

The complete equipment of the machine consists of two units, a sorting unit and a sizing unit. A hopper about waist high is placed at the head of the machine to receive the tomatoes from the field containers. The tomatoes roll from the hopper onto the sorting unit which consists of a series of rollers set on an incline of about 30°. From three to five sorters are stationed on each side and as the tomatoes are conveyed up this incline the rollers turn the tomatoes so

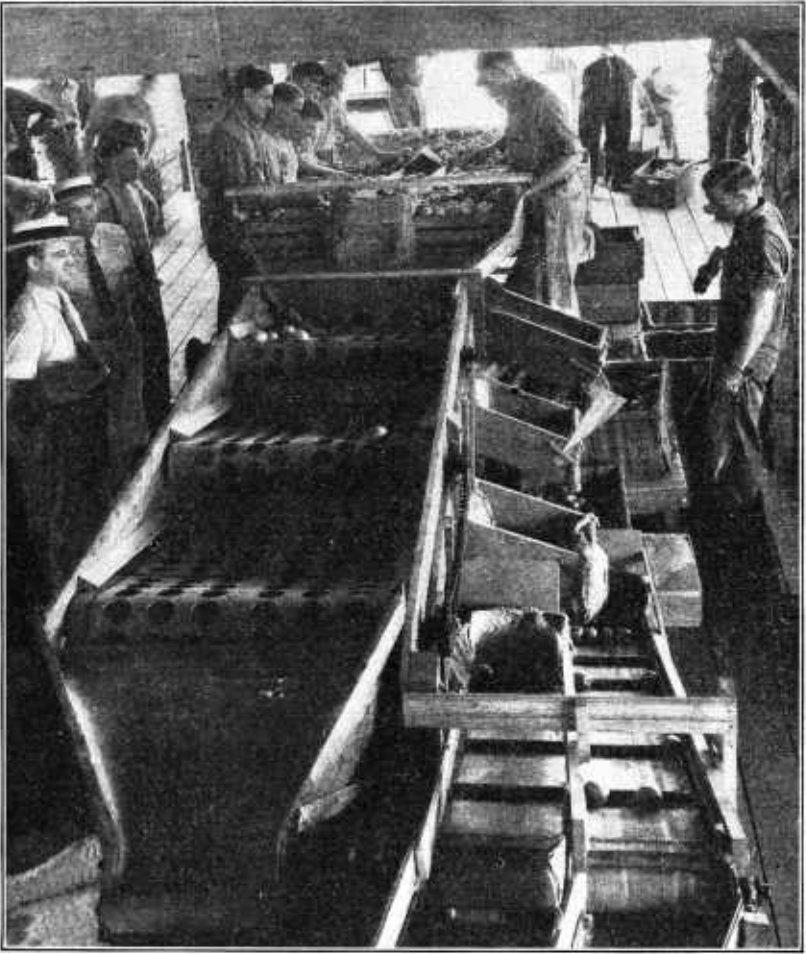


FIGURE 12.—Type of sizing machine now used rather extensively in some of the more important producing sections.

the sorters can see and remove defective specimens. A division equipped with a conveyor belt running lengthwise through the center of the unit provides a convenient method for the sorters to dispose of the cull fruit.

As the tomatoes reach the end of the sorting unit they roll onto another rather sharply inclined conveyor which elevates them to the sizing unit. This consists of a series of three wide composition continuous belts which have been perforated with round holes at regu-

lar intervals. There is a difference of one-fourth of an inch in the diameter of the holes in the three belts. The first belt removes the smallest tomatoes, the second the next larger size, and the third a still larger size. The largest tomatoes drop off the end of the third belt. In most of the packing houses where the machines are used the tomatoes are caught in field boxes as they drop through the holes. A few houses have provided conveyor belts to carry the tomatoes directly to the packing bins. In Utah and California where the machines are being operated the tomatoes drop through the belts into padded bins after which they are removed and carried to the packing bins.

The size of the machine to install in a packing house will depend on the volume of tomatoes to be packed.

WASHING EQUIPMENT

The practice of washing tomatoes before they are packed is confined largely to the Homestead section in Florida where the tomatoes are produced on marl soil. During rainy periods some of this soil is splashed on the tomatoes, giving them such an unattractive appearance that it is almost necessary to wash them before they are packed.

The washing equipment is not standardized but usually consists of a tank through which a roller conveyor passes. The tank is filled with water and the tomatoes are carried through the water on the conveyor. They are usually rinsed with a clean-water spray as they emerge from the tank on the inclined conveyor. The conveyor is usually extended to considerable length, and the sorters are stationed on either side to remove defective fruit. During this operation the tomatoes have an opportunity to drain thoroughly. The tomatoes should not be wrapped and packed before they are dry, as adhering moisture is likely to discolor the wrappers and make the pack unattractive.

In all producing sections under certain conditions tomatoes delivered to packing houses in field crates are likely to be more or less dusty. In many instances there is enough adhering dust to injure the appearance of the tomatoes and it is necessary to remove it before the tomatoes are wrapped and packed. Certain Florida shippers who have their packing houses equipped with roller conveyors find it convenient and economical to remove dust from tomatoes with a feather duster. An employee, stationed at the upper end of the conveyor ahead of the sorters, passes the duster back and forth over the tomatoes a few times as they roll on the conveyor before him. This assists the sorters who can see defective tomatoes better after the dust has been removed.

OPERATION OF A PACKING HOUSE

Competent and careful supervision is necessary in the successful operation of a tomato-packing house. The foreman in charge should be thoroughly familiar with the standards under which the tomatoes are packed and the various methods used for packing different sized tomatoes in the containers. He should be able to train employees in the art of sorting and packing as well as detect quickly any employee

who is not doing his work properly. The failure of one or two employees to do their work in accordance with the standards set by the establishment may mean a considerable loss to a concern when final returns are calculated.

In some of the larger producing sections professional packers are employed. This is particularly true in western areas where fruit packers move from place to place as the various shipping seasons progress. In many sections local packers have proved to be more satisfactory than the professional who moves from place to place. Local help is usually more responsible and much easier to handle.

MOVEMENT OF THE TOMATOES THROUGH THE HOUSE

Sorting and packing equipment should be located within the house so that the minimum amount of labor is required in handling the tomatoes. Usually the movement will be across the width of the house, as the driveway and receiving platform will be along one side and the railroad tracks or driveway for receiving packed fruit will be on the opposite side. If the house is located on a railroad siding and an adequate supply of cars is always available, storage space for packed lugs need not be so great. In this case it would probably be best to locate the sorting and packing equipment lengthwise toward the track side of the house. This will leave ample space for receiving and stacking the unpacked fruit as it is delivered by the growers on the opposite side of the house, and the packed fruit will only have to be transported a short distance to the cars.

If the packing house is not on a railroad siding, or for any reason a considerable amount of storage space for packed lugs is needed, it would probably be best to locate sorting and packing equipment near the center, lengthwise of the house if adequate light can be provided.

In packing houses that are to be equipped with sizing machines the arrangement with respect to packing bins will depend largely on the size and shape of the house. In the long rectangular house it may be possible to locate the packing bins in line with the machine, but in the short type of house the machine will probably have to be located opposite the bins.

RECEIVING THE FRUIT

An experienced employee should have charge of receiving the loose fruit from the growers. When tomatoes are bought at a flat price per field crate, he should make whatever deductions are necessary for poorly filled crates or improperly picked stock. In some sections purchases are usually made on a packed-lug basis. If the packing house is run on a cooperative basis, each lot should be tagged to show the grower's name and number of packages. As the various lots are sorted and packed, a statement of the number of lugs of each grade and size is added and the tag is sent to the office for the permanent record. Perhaps the most important duty of the receiver is to encourage growers to insist on proper care in picking and handling. When this phase of the work is overlooked, the cost of sorting is increased and frequently immature and badly blemished fruit is included, which brings a heavy loss.

The use of clamp or platform trucks or ordinary grain hand trucks to move the fruit from the unloading platform to the point where

they are to be sorted are important labor-saving devices employed in most packing houses. The type of truck used will depend largely on the kind of container in which the tomatoes are delivered to the packing house. The truck may also be used to transfer the packed lugs to the loading platform or to the cars. However, many houses are equipped with roller conveyors which transfer the lugs from a point near the lidding benches directly to the cars or to the side of the house for stacking.

SORTING AND SIZING

Tomatoes are sorted by hand labor for market quality and defects. They are also sized by hand except in those sections where sizing machinery has come into use.

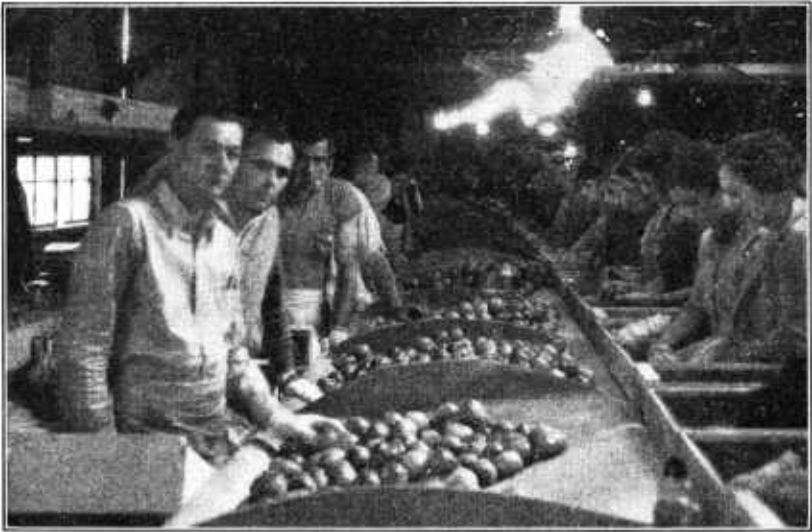


FIGURE 13.—Sorting and packing mature-green tomatoes in a central packing house. The sorters shown at the right are removing the tomatoes directly from the field crates, placing the non-defective ones in the packing bins. The packers at the left select tomatoes of the proper size to pack a certain sized pack. The packed lugs are placed on the roller conveyor shown at the extreme left leading to the lidding bench. Artificial light is employed in this packing house.

In packing houses where sizing machines, conveying belts, or roller-sorting conveyors have not been installed the sorters are usually stationed along one side of a series of bins (fig. 11) and the packers work on the opposite side. Many packing-house operators, however, prefer to have the employees sort the tomatoes directly from the field containers instead of first dumping the tomatoes into sorting bins (fig. 13). They claim that the tomatoes are subject to less handling and so are less liable to become bruised. Sorting from the field containers also means less space in the packing house for the sorting operations.

Those packing-house operators who dump the tomatoes into sorting bins before they are sorted contend that the sorters have more freedom of action and a better opportunity to see the blemished fruit than when they are sorted from the field containers. If mature-green stock is being packed, the pink or ripe tomatoes are

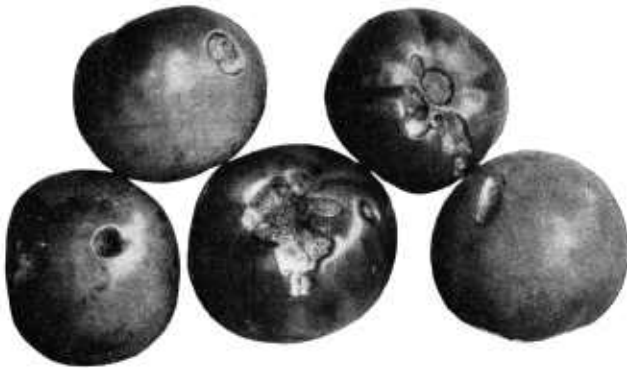


FIGURE 14.—Worm-eaten tomatoes (above) and those injured by large stake or wind scars (below) should not be packed with the first-grade stock.

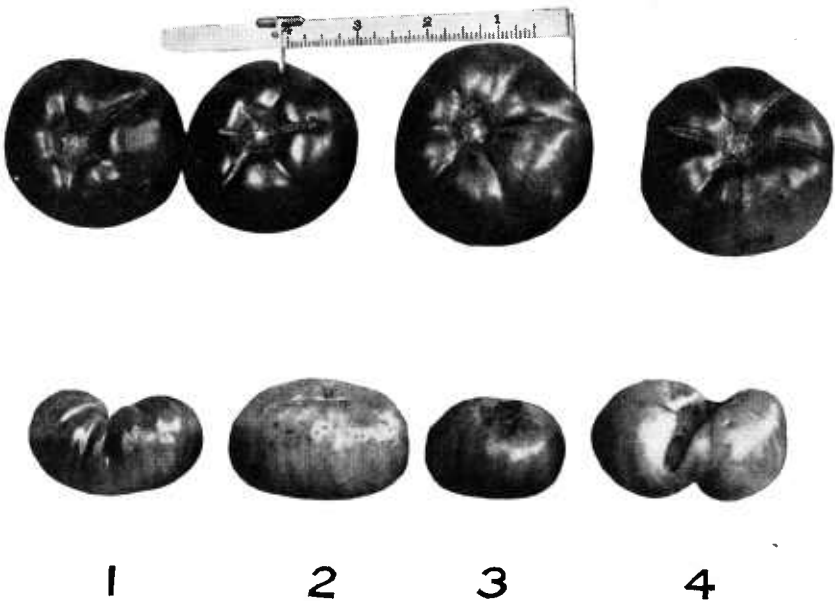


FIGURE 15.—Tomatoes showing deep stem end or growth cracks (above) and those that are curly or rough (1), smooth crooks (2), or show large scars and catfaces (3 and 4) should be sorted from the first-grade stock.

placed in field crates and carried to special packers or placed in separate compartments of the bin. The fruit that is satisfactory for packing is placed in the packing bins directly in front of the sorters.

In some packing houses the sorter also does the sizing. As he handles each tomato he gages the size by eye and places it in the bin intended for that size. In other packing houses the sorters merely separate the fruit into the various grades and it is left to the packers to select the tomatoes of the proper size for the particular pack they are making.

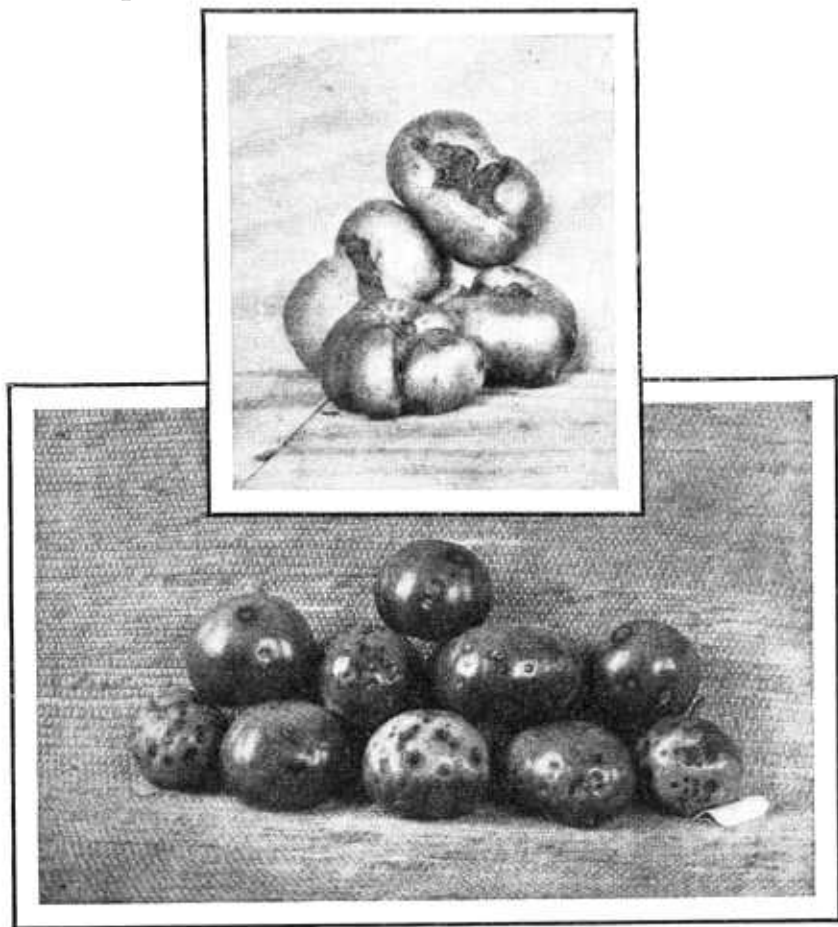


FIGURE 16.—Bad "catfaces" and tomatoes affected with nailhead spot (*Macrosporium tomato*) should be excluded even from the second grade.

The quality of the pack and the uniformity of size put up by any packing house is largely dependent on the work of the sorters and packers. Unless the tomatoes are sized fairly uniformly and defective fruits are removed the pack will show irregularity of sizing and the quality will be lowered. The packers may occasionally note and eliminate defective tomatoes missed by the sorters. But as they must

work very fast they cannot be expected to make up for the deficiencies of the sorters.

Some packing-house operators have found it more satisfactory to use a canvas conveying belt or roller-sorting conveyor to take the place of the sorting bins. This is true in some parts of Florida where the houses are equipped with washers. As the tomatoes leave the washer they are conveyed on a belt past the sorters who remove defective fruit. Some packing houses in California are also equipped with conveyor belts or roller conveyors. Many packing-house operators claim that such an arrangement enables a smaller number of sorters to do the same amount of work, gives greater uniformity in the quality of stock in the packed lugs, and provides a better distribution of the fruit to the packers. Sorters should be arranged along the conveyor according to their proficiency, the most experienced members of the crew giving the final inspection. Various types of defective tomatoes are illustrated in figures 14, 15, and 16.

In houses that use sizing machines the sorters are stationed on either side of the sorting unit. They remove the cull fruit and allow the remaining tomatoes to pass on to the sizing unit. Machine sizing undoubtedly insures more uniform sizing of tomato packs than sizing by hand. Irregular sizing of hand-sorted tomatoes from many sections is a constant complaint of receivers in the markets. In most instances they are willing to pay a premium for uniformly sized fruit.

PACKING

PACKING THE LUG

The lug-box pack now employed generally throughout those areas that ship green-wrap tomatoes is prepared in central packing houses under the supervision of the shipper. Experienced packers are usually employed for this work as they must turn out considerable volume in order to make the use of this kind of package profitable.

The packer works at a slightly inclined bench directly adjacent to the bins in which the sorted tomatoes are placed (fig. 13). He faces in the direction of the bench upon which the empty lug is resting at a convenient height. The paper holder is either attached or placed within convenient reach at the side of the lug box. A rubber finger cot is often worn on the thumb or forefinger of the packer to facilitate removal of the paper. The packer picks up a wrap from the holder and at the same time selects a tomato from the bin. The tomato is tossed into the palm of the right hand which is holding the wrapper. This jerks up the edges of the wrapper and the left hand is quickly brought forward to fold the loose edges of the wrapper around the tomato or to hold it while the tomato is given a half twist. The wrapped tomato is then placed in its proper position in the lug with folded or twisted portion underneath to act as a cushion while the left hand reaches for another tomato. If the packer is left handed he will face in the opposite direction and the movements of right and left hands will, of course, be reversed. The experienced packer will pack tomatoes about as fast as he can pick them out of the bin.

In packing a lug to secure the proper bulge, skilled packers usually select slightly larger tomatoes for the center of the lug than for the

ends. Some tilting of the fruits is also practiced as necessary. As a result of these practices the tomatoes in the center of the lug are usually more tightly packed than those in the ends.

The general shape of the tomatoes and the size determine to a large extent the manner in which the packer will arrange the tomatoes in the lugs. Obviously distinctly globe-shaped tomatoes must be arranged differently than those that are generally flat-shaped. In general, tomatoes of the larger sizes are packed flat in all three layers. It is usually necessary to pack medium- and small-sized tomatoes on edge in one or more layers to secure the proper height of the pack. Often the two lower layers of tomatoes are packed on edge and the top layer flat with blossom end up. Certain other sizes will be packed with the tomatoes on edge in all layers. Each individual packer usually develops his own technique for arranging different sizes and shapes of tomatoes in the lugs. From all outward appearances the similar sized packs of tomatoes put up by different packers may be the same but close examination may show that the position of individual tomatoes with respect to packing flat, tilting, or packing on edge varies considerably.

Whenever the packer finishes packing a lug he places a numbered pasteboard or ticket on the lug which is then removed to the lidding bench or to the conveyor leading to that point. These tickets are collected by the ligger and sent to the office for recording the packer's daily output.

Aside from these general practices employed in packing lugs, tomato packers in the various sections have developed three distinct methods of arranging the tomatoes in the different layers. The common practice in sections where the lug is used is to place the tomatoes so that one tomato will be directly above another in the various layers. This is known as the square arrangement and is illustrated in figure 17.

Some shippers, particularly in California, use a method known as the offset arrangement for some sizes of fruit. In this method (fig. 18) alternating space is left at the end of each row in each layer, and theoretically the weight of each tomato in one layer is supported by two tomatoes in the next lower layer.

In the third method of arrangement termed "diagonal" a certain amount of space is left between each tomato in each layer. This method is illustrated in figure 19 and is used by some California shippers for packing small-sized tomatoes. Four layers of fruit are packed in the lug where this method is employed. Two layers will have one

SQUARE ARRANGEMENT

ALL
LAYERS

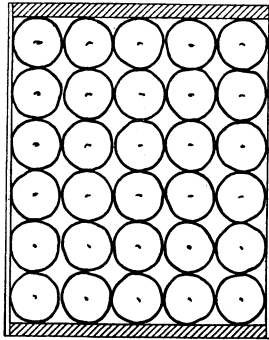


FIGURE 17.—Diagram illustrating the square arrangement for packing tomatoes in lugs, which is the method commonly used in all producing sections. In this arrangement one tomato is placed directly above another in the various layers, thus making the relative position of the tomatoes the same in all layers. The size of tomatoes as shown in this diagram is designated as 5 x 6.

OFFSET ARRANGEMENT

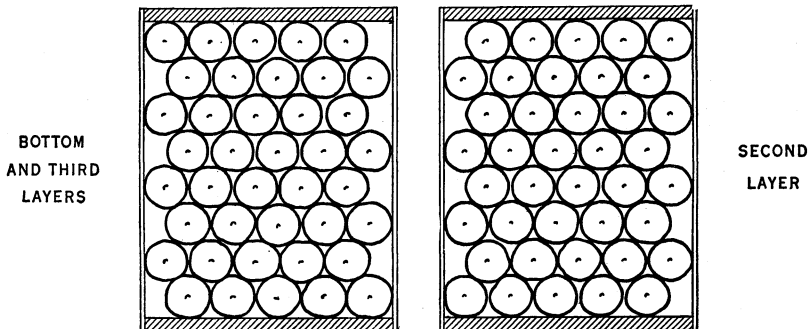


FIGURE 18.—Diagram illustrating the offset arrangement for packing tomatoes in lugs used by some California shippers. Alternating space is left at the end of each row in each layer so that the weight of each tomato in one layer is supported by two tomatoes in the next lower layer. If this arrangement is used for small tomatoes a fourth layer is included, and the position of the tomatoes will be the same as in the second layer shown in the diagram. The size of tomatoes arranged in the top layer as shown in the diagram is designated as 5 x 8.

more tomato than the other two layers, depending on the manner in which the packer starts the pack. As shown in figure 19, there are 5 rows of 5 and 4 rows of 4 tomatoes extending crosswise of the lug, making a total of 41 tomatoes in the bottom and third layers. In the second and top layers there are 5 rows of 4 tomatoes and 4 rows of 5 tomatoes or a total of 40 tomatoes in these layers. The diagonal pack is more difficult to pack properly than either the square or offset pack.

DIAGONAL ARRANGEMENT

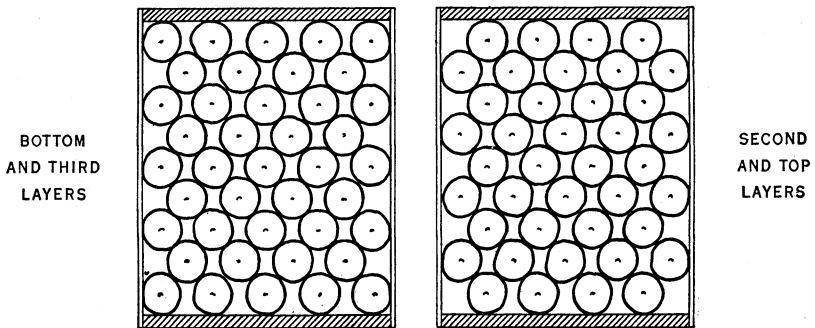


FIGURE 19.—Diagram illustrating the diagonal arrangement in layers for packing tomatoes in lugs used to some extent for small tomatoes by some California shippers. A certain amount of space is left between each tomato in each layer and four layers are packed in the lug to build the pack to the proper height and secure the required net weight. Note that the bottom and third layers contain one more tomato than the second and top layers. The size of tomatoes arranged as shown in this diagram is designated as 4-5 x 9.

Four styles of lug packs are recognized in the United States standards for fresh tomatoes. They are straight pack, extra-row pack, bridge pack, and double-wrap pack. In all of these styles of packs the tomatoes must be at least fairly uniformly sized, and the net weight in the lugs shall be not less than 30 pounds in order to be considered as United States standard packs.

A straight pack is packed with the same number of rows of tomatoes each way of the lug in each layer. Receivers in the markets generally favor the straight pack over all other styles of packs and it is becoming increasingly more popular each year. This style usually insures greater uniformity in size of the tomatoes throughout the lug. Some of the most common U. S. straight packs and the method of arranging the tomatoes in the lugs are shown in figure 20. In

U. S. STRAIGHT PACKS

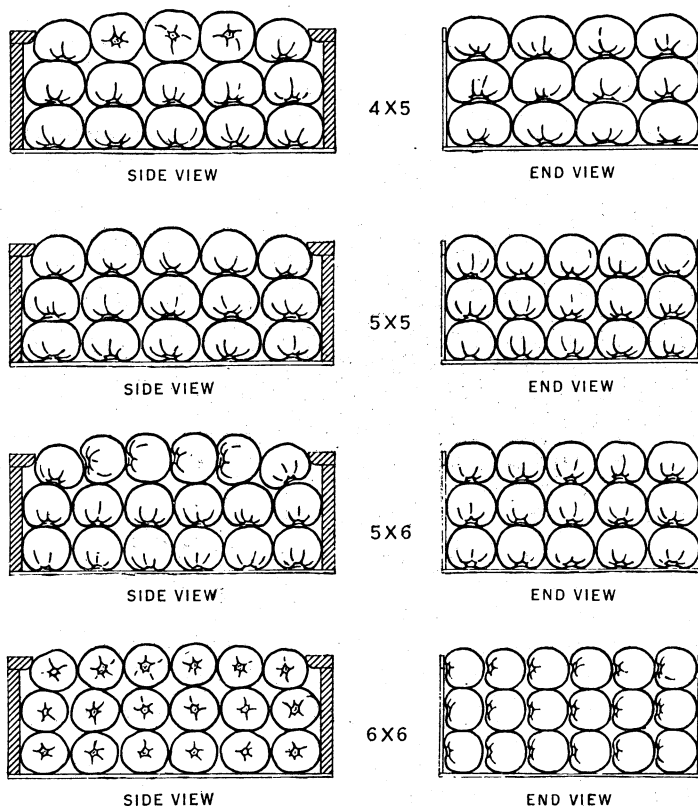


FIGURE 20.—Diagram showing the arrangement commonly used by packers for packing various sizes of U. S. straight-style packs. Note that all layers have the same number of tomatoes and that they are fairly uniform in size. Receivers generally favor this style of pack.

these diagrams wide cleats are used on the lugs. Many shippers use narrow cleats of the same width as the end pieces of the lug, thus insuring greater uniformity of size in all layers.

In the extra-row style of pack the top layer contains one row less of tomatoes one way of the lug than the other layers. Therefore, the tomatoes in the top layer will be somewhat larger than those in the other layers. If the lugs are fitted with wide cleats the variation in size in the layers need not be so great although the width of the cleats extending over the ends of the lug is not enough to compensate

for the full width of a row of tomatoes. The extra-row style of pack is often severely criticized by receivers in the markets because the tomatoes in the top layer, or shown face, are larger than the tomatoes in the other layers. This style of pack is still used extensively but in many sections is gradually being supplanted by the straight method. Common methods of arrangement employed by packers in packing U. S. extra-row packs with various sizes of tomatoes are illustrated in figure 21.

U. S. EXTRA ROW PACKS

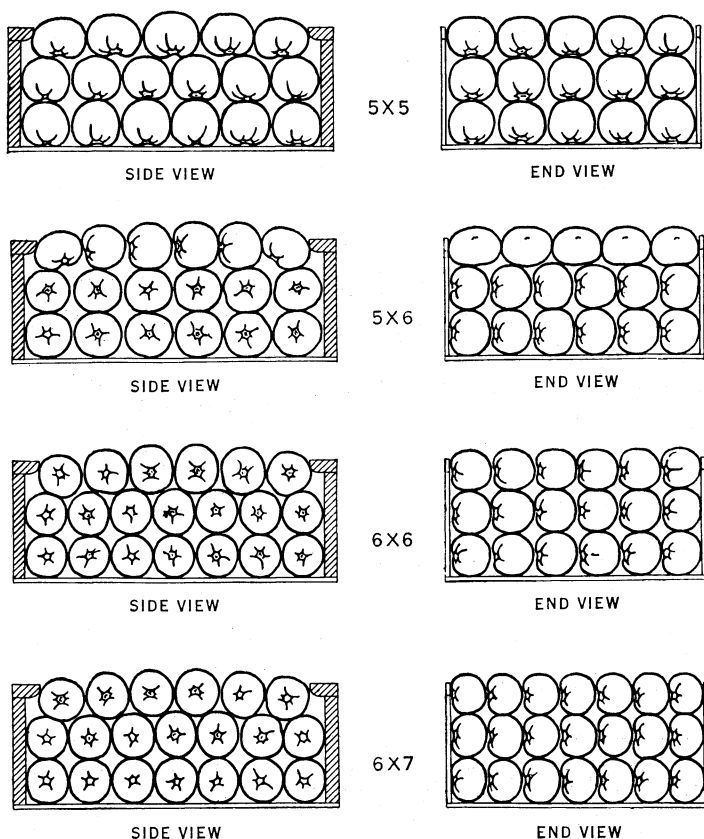


FIGURE 21.—Diagram showing arrangement commonly employed by packers for packing various sizes of U. S. extra-row style packs. Note that the top layer in each pack has one row less of tomatoes one way of the lug than the lower layers and that the tomatoes are generally somewhat larger.

The term "bridge pack" is used to describe the style of pack having three full layers and part of a fourth. It is employed mostly for tomatoes of the smaller sizes where three layers will not fill the lug to the proper height and insure the required net weight. The bridge is usually made by leaving one or two rows vacant both ways of the lug in the second layer. However, some Texas packers make

the bridge by spacing the tomatoes apart. The upper two layers are then packed regularly and the bridge tends to give the proper height and weight to the pack with the bulge in the center. The position of the tomatoes in a typical U. S. bridge pack is illustrated in figure 22.

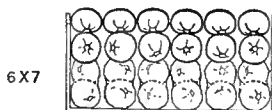
Often small-sized tomatoes are packed with two tomatoes in a wrapper in the bottom layer and sometimes in the middle layer as well. This

style of pack is called the double-wrap pack. In starting the pack one row of tomatoes wrapped double is placed flat in the end of

U. S. DOUBLE WRAP PACK



SIDE VIEW



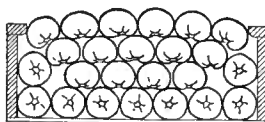
6 X 7

END VIEW

FIGURE 23.—Diagram showing the position of the tomatoes in a U. S. double-wrap pack commonly used for small-sized tomatoes. The diagram shows only the tomatoes in the bottom layer wrapped double. Often the tomatoes in the middle layer are wrapped double.

insure filling of the lug to the proper height. The tomatoes in the second layer are wrapped either singly or doubly. The tomatoes in the top layer are wrapped in a single wrapper. Figure 23 illustrates

U. S. BRIDGE PACK



SIDE VIEW



END VIEW

FIGURE 22.—Diagram showing the position of the tomatoes in a typical U. S. bridge pack. The bridge is used to build the pack to the proper height and secure the required net weight.

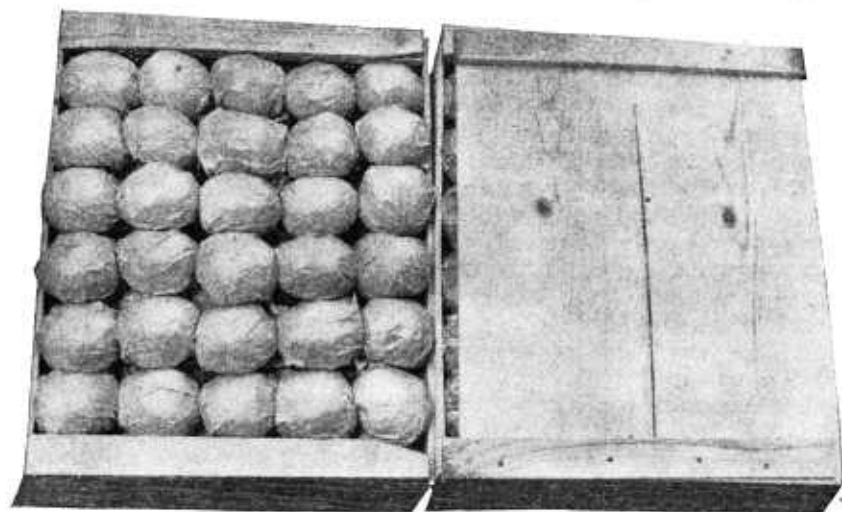


FIGURE 24.—The size in most lug packs is designated by the number of rows of tomatoes running both ways of the lug in the top layer. This represents a well-packed lug box showing medium-sized tomatoes packed 5 x 6.

the arrangement of the tomatoes in a U. S. double-wrap pack with the lower layer only having two tomatoes to the wrapper.

The size of tomatoes packed in lug boxes is designated commercially by the number of rows of tomatoes running both ways of the lug in the top layer with the exception of lugs packed with the tomatoes arranged diagonally. For example, the top layer of a lug packed with five rows of tomatoes extending lengthwise and six rows extending crosswise would be designated as a 5 x 6 pack (fig. 24). The designation of size by stating the number of rows of tomatoes both ways of the lug applies to all styles of packs heretofore described and to all methods of arrangement except the diagonal. Shippers at present are designating size of diagonal packs by using two figures to show the number of tomatoes in the rows crosswise of the lug and a third figure to indicate the total number of crosswise rows in the layer. For example the size of the tomatoes in the diagonal pack illustrated in figure 19 is designated 4-5 x 9, which means that there are four and five tomatoes in the alternating rows crosswise of the lug with nine such rows in the layer. Other diagonal arrangements commonly packed are 4-4 x 10, 4-5 x 10, and 4-3 x 12.

The methods now employed for designating size are often misleading and are frequently the cause of disputes between shippers and receivers. A description of the top layer does not always give a true picture of the size of the tomatoes in the lower layers. The tomatoes in the lower layers of extra-row packs are generally smaller than those in the top layer. The same may be true of bridge and double-wrap packs. The method now employed for describing size of diagonal packs is difficult to understand and the distant buyer not thoroughly acquainted with the method may find it hard to visualize the size of tomatoes quoted. A better method of describing the size of tomatoes packed in lugs would be to specify the number of tomatoes in the package, provided the tomatoes are fairly uniform in size.

PACKING CLIMAX, SPLINT, AND FIBERBOARD BASKETS

The packing of tomatoes in Climax, splint, and fiberboard baskets is much less complicated than packing tomatoes in lugs or carriers. For this reason these types of packages are adapted for use in the East North Central and Middle Atlantic States where the fruit is mostly packed at the farm in the pink and ripe stages by the producer or members of his family. In Ohio, however, considerable quantities of both greenhouse and field-grown tomatoes are packed in baskets at central packing houses.

As a general rule producers of field-grown tomatoes using 12-quart Climax baskets do not sort the fruit to uniform sizes and pack them in separate containers. Many producers pack separately the small-sized fruit under 2 or $2\frac{1}{4}$ inches in diameter, but the remainder is packed together. This often gives a range in size from about 2 inches to over 4 inches in diameter in the same package. Some dealers prefer to handle fruit more uniformly sized but others would rather have a range of size to satisfy the varied wishes of consumers.

Medium and large tomatoes are generally packed three layers deep in 12-quart Climax baskets. If small fruit is packed separately four layers are required to fill the basket. As a rule the tomatoes are not wrapped. They are packed flat or on edge depending on the size. Often the lower layers are packed on edge and the top layer is packed flat with the blossom end up. In Ohio the growers aim to pack 20 pounds net to the basket. Many producers in other sections simply fill the package and pay no attention to the net weight. Packed Climax baskets of 12-quart capacity are illustrated in figure 25.

The 8-quart splint and fiberboard baskets are packed with two layers of fruit. Growers of greenhouse tomatoes generally wrap the better grades of fruit, especially if it is to be transported any great distance. Small-sized tomatoes and fruit of the lower grades are usually not wrapped. Since greenhouse tomatoes are ordinarily picked with stems and calyxes attached the wrappers offer considerable protection to the fruit from stem punctures.

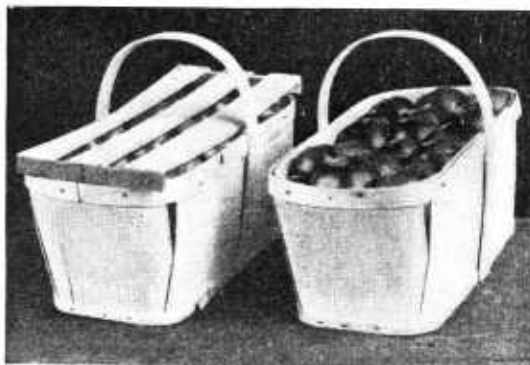


FIGURE 25.—The 12-quart Climax basket is usually packed with three layers of tomatoes.

It is customary for the greenhouse growers to pack separately three different sizes of fruit which they class as small, medium, and large. Tomatoes under 3 ounces in weight are considered small. Those ranging from 3 to about 8 ounces are classed as medium and those over 8 ounces are considered large. The lack of uniformity in size of fruit classed as medium and large is not desirable from the standpoint of some dealers. However, many dealers prefer to have different sizes of tomatoes in such a small package to meet the different needs of consumers.

In Ohio, where the 8-quart baskets are used most extensively, producers of field-grown tomatoes pack 10 pounds to the basket while greenhouse growers pack only 8 pounds to the basket. Most of the greenhouse growers and many producers of field-grown fruit place paper dividers between the layers of fruit. It is common practice to lid the packages with closely fitting fiberboard covers, but some growers do not lid packages that are trucked to nearby local markets.

PACKING SIX-BASKET CARRIERS AND FOUR-BASKET FLATS

In most particulars the operation of packing six-basket and four-basket carriers is the same. The packing benches, which should be

of a height to suit the individual packers, are built with a slight slope toward the packer to tilt the package enough to hold the tomatoes in place during the packing operation. The holder for the paper wrappers is placed at one corner of the bin or attached to the package within convenient reach. The dividing trays of the six-basket carrier are placed on racks commonly located above the packing bins, while the till baskets are stored underneath.

In packing these containers the packer usually faces the bin and reaches over the package for the fruit as contrasted with lug packing where the packer usually stands with the bin at his side.

Tomatoes are packed in six-basket carriers, according to a definite system by experienced help with two layers in each till basket. The four-basket flats should also be packed according to a definite system, but in case inexperienced help is employed little attention is usually given to uniform sizing. The number, arrangement, and size of tomatoes in the commercial packs for these containers are given in tables 3 and 4. Figures 26 and 27 show the arrangement of some of these packs in these containers.

TABLE 3.—*Number, arrangement, and size of tomatoes in the commercial packs of the 6-basket carrier*

Numerical count	Arrangement of bottom layer	Approximate diameter	Arrangement of top layer	Approximate diameter
		<i>Inches</i>		<i>Inches</i>
72.....	6 flat (3-3).....	$3\frac{1}{4}$ to $3\frac{1}{2}$	6 flat (3-3).....	$3\frac{1}{2}$ to $3\frac{3}{4}$
84.....	6 flat (3-3).....	$3\frac{1}{4}$ to $3\frac{1}{2}$	8 flat (4-4).....	$3\frac{1}{4}$ to $3\frac{1}{2}$
96.....	8 flat (4-4).....	3 to $3\frac{1}{2}$	8 flat (4-4).....	$3\frac{1}{4}$ to $3\frac{1}{2}$
108.....	6 flat (3-3).....	$3\frac{1}{4}$ to $3\frac{1}{2}$	12 edged (4-4-4).....	$2\frac{1}{2}$ to 3
120.....	8 flat (4-4).....	3 to $3\frac{1}{2}$	12 edged (4-4-4).....	$2\frac{1}{2}$ to 3
144.....	12 edged (4-4-4).....	$2\frac{1}{4}$ to $2\frac{3}{4}$	12 edged (4-4-4).....	$2\frac{1}{2}$ to 3
162.....	15 edged (5-5-5).....	$2\frac{1}{4}$ to $2\frac{3}{4}$	12 edged (4-4-4).....	$2\frac{1}{2}$ to 3
180.....	15 edged (5-5-5).....	$2\frac{1}{4}$ to $2\frac{3}{4}$	15 edged (5-5-5).....	$2\frac{1}{4}$ to $2\frac{1}{2}$
216.....	18 edged (6-6-6).....	$1\frac{3}{4}$ to $2\frac{1}{4}$	18 edged (6-6-6).....	2 to $2\frac{1}{4}$
Gem.....	24-27.....	$1\frac{1}{8}$ to 2	16-18.....	2 to $2\frac{3}{8}$

TABLE 4.—*Number, arrangement, and size of tomatoes in the standard commercial packs of the 4-basket flat*

Numerical count	Arrangement of bottom layer	Approximate diameter	Arrangement of top layer	Approximate diameter
		<i>Inches</i>		<i>Inches</i>
48.....	6 flat (3-3).....	3	6 flat (3-3).....	$3\frac{1}{4}$ to $3\frac{1}{2}$
56.....	6 flat (3-3).....	3	8 edged (4-4).....	$2\frac{3}{4}$ to $3\frac{1}{2}$
56.....	8 edged (4-4).....	$2\frac{1}{2}$	6 flat (3-3).....	$3\frac{1}{4}$ to $3\frac{1}{2}$
60.....	9 edged (3-3-3).....	$2\frac{3}{8}$	6 flat (3-3).....	$3\frac{1}{4}$ to $3\frac{1}{2}$
60.....	6 flat (3-3).....	3	9 edged (3-3-3).....	$2\frac{1}{2}$ to $2\frac{3}{4}$
64.....	8 edged (4-4).....	$2\frac{1}{2}$	8 edged (4-4).....	$2\frac{3}{4}$ to 3
72.....	6 flat (3-3).....	3	12 edged (4-4-4).....	2 to $2\frac{1}{4}$
72.....	8 edged (4-4).....	$2\frac{1}{2}$	10 edged (3-4-3).....	$2\frac{1}{2}$
80.....	10 edged (3-4-3).....	$2\frac{1}{4}$ to $2\frac{1}{2}$	10 edged (3-4-3).....	$2\frac{1}{2}$
84.....	10 edged (3-4-3).....	$2\frac{1}{4}$ to $2\frac{1}{2}$	11 edged (4-3-4).....	$2\frac{1}{2}$ to $2\frac{1}{2}$
88.....	11 edged (4-3-4).....	2 to $2\frac{1}{4}$	11 edged (4-3-4).....	$2\frac{3}{8}$ to $2\frac{1}{2}$
96.....	12 edged (4-4-4).....	2 to $2\frac{3}{8}$	12 edged (4-4-4).....	2 to $2\frac{1}{4}$



FIGURE 26.—Well-packed six-basket carriers of the 144 and 180 packs ready for lidding. Tomatoes at each end of the crate are even with the headpiece, while stock near the center of the crate shows about 1-inch bulge.

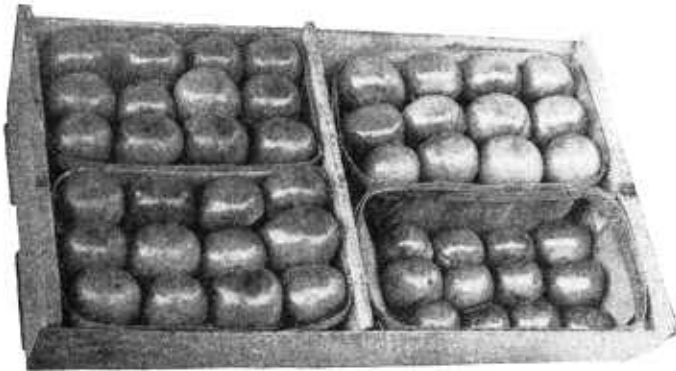


FIGURE 27.—A well-packed four-basket flat showing the 96 pack in unwrapped fruit. In most instances this is the smallest size packed for shipment. Note the tomatoes are edged in both layers.

PACKING HAMPERS AND ROUND STAVE BASKETS

Packing the $\frac{5}{8}$ -bushel hamper and the $\frac{1}{2}$ -bushel and 1-bushel baskets with pink and ripe tomatoes for trucking to nearby markets in the Eastern States is a comparatively simple operation. As a rule all sizes of tomatoes are jumbled in these containers. Some growers, however, often ring-face the top layer with fairly uniform

sized tomatoes with blossom end up in order to give the package a more attractive appearance. Ring-facing packages is not to be recommended unless the tomatoes in the shown face are reasonably representative in size and quality to the remainder of the tomatoes in the package.

Care should always be exercised in placing the tomatoes in hampers or baskets to prevent unnecessary bruising of the fruit. Overripe tomatoes should not be allowed in the package as they are liable to be crushed by the weight of those above them.

PACKING THE NEW JERSEY 20-QUART CRATE

The New Jersey 20-quart crate is ordinarily packed at the farm. The tomatoes are arranged in more or less definite rows and layers but usually there is no attempt to size the fruit uniformly or to pack any definite number of tomatoes or layers of tomatoes in the

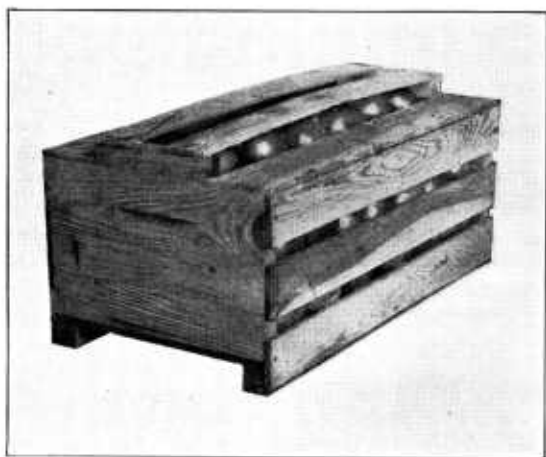


FIGURE 28.—Tomatoes packed in New Jersey 20-quart crates are generally not uniformly sized but are arranged in more or less definite rows and layers.

package (fig. 28). Many receivers in the markets repack the tomatoes into smaller packages before they sell them to the retail trade.

The demand for a smaller package by the trade is causing a gradual decline in the use of the 20-quart crate in New Jersey and the 12-quart Climax basket is taking its place.

PACKING THE WESTERN PEACH BOX AND THE FOUR-BASKET STRAIGHT-SIDED CRATE

The western peach box used in some parts of the West for local shipments is ordinarily packed by the growers. Usually two layers of fruit are packed in more or less definite rows in this container.

The four-basket straight-sided crate (fig. 9) used for local shipments of ripe fruit in California is also packed by the growers. Each till basket is filled with two layers of tomatoes but little attention is given to uniform sizing of the fruit.

PACKING THE 20-POUND LUG

Growers in Illinois pack the 20-pound Sterling lug with two layers of fruit usually with a cardboard under each layer. The more progressive growers pay more attention to sizing of the fruit than most growers in other sections who pack their tomatoes at the farm in other types of packages. Medium- and large-size tomatoes are placed flat in the lug, while the smaller sizes are often packed on edge, to build the pack to the proper height. No effort is made to pack the layers uniformly with a certain number of tomatoes, but for medium-sized fruit four or five tomatoes are commonly placed in rows crosswise of the lug. As many tomatoes are placed in the lengthwise rows as it takes to fill up the space, which is generally six or seven. The larger tomatoes are often packed diagonally with three and two tomatoes in alternating rows crosswise of the lug.

The 20-pound lug makes a neat and attractive package when packed regularly with uniformly sized fruit of good quality.

MARKING PACKAGES

It is general trade practice to stamp the style of pack in the upper corner of one end of the container when tomatoes are packed in lugs. The size of tomatoes packed in lugs is designated by the arrangement of the tomatoes in the top layer. For example, a lug packed five rows wide and 6 rows long in the top layer is stamped 5 x 6. In some packing houses the grower's initials or his lot number are also marked on the package.

During recent years many States have enacted laws requiring certain other markings to be shown on packages. In general, these laws require such markings as the name of the variety, the place where grown, the name of the grower or his lot number, the grade and the net weight or numerical count. Shippers should consult the laws of their State to make sure of the markings required to be shown on tomato packages.

Under the provisions of the net-weight amendment to the United States Food and Drugs Act, shippers are required to stamp packages either with the net weight or dry measure. It is therefore general practice to show the net weight on lugs and crates and to show the dry measure on baskets. Crates containing till baskets usually show the number of till baskets with the capacity of each till basket as, "contents six 4-quart baskets."

Most tomato shippers who pack lug boxes use lithographed or printed labels to identify their particular brands. These should be attached neatly to the containers as careless labeling always gives the impression that the pack is also poor. Generally labels are pasted on before the empty containers are furnished to the packers but some shippers do the labeling in the car as each stack is stowed.

LIDDING

In most of the central packing houses where lugs or other packages requiring nailing are packed the lidding is done by hand with the aid of a lidding press. The lidding press also serves as a lidding bench. It consists of a framework equipped with press arms which

are operated by means of a foot lever. The operator places a packed lug in the press, places the lid in position over the fruit and applies enough pressure on the foot lever for the press arms to force down the ends of the lid flush with the end pieces on the lug. He then drives the nails and releases the foot lever to allow the press arms to spring back to their normal position.

If a lidding press is not provided a substantially constructed lidding bench of convenient height should be furnished the nailer.

Lidding presses or lidding benches are usually placed in the rear of the packers' aisle parallel to the packing bins. If the packers place the packed lugs on a roller conveyor leading to the lidding press or lidding bench it is most convenient to have the top of the rollers even or slightly above the top of the bench so that the lugs will slide

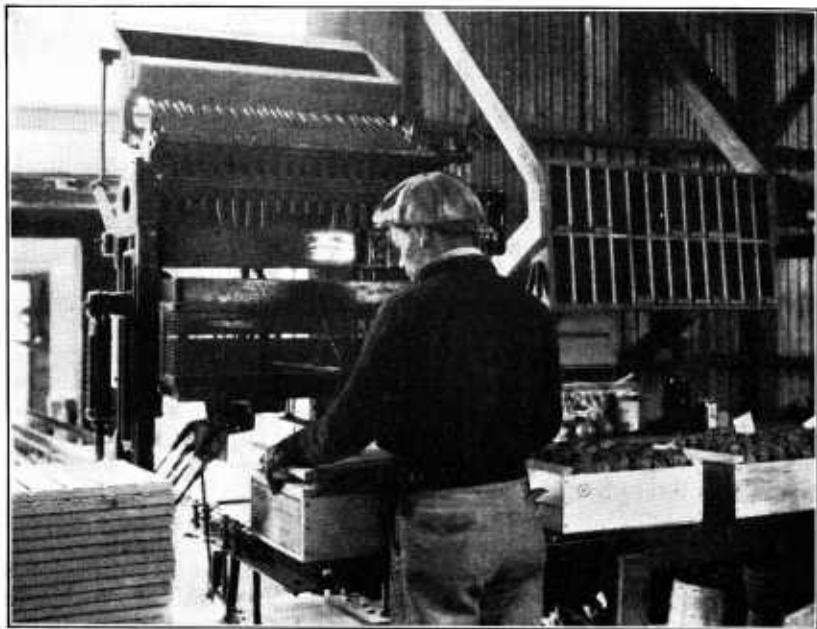


FIGURE 29.—Electrically operated lidding machines are often used in packing houses where a large volume is packed.

easily into position for nailing. The lids should be within easy reach of the nailer from a rack overhead or a stack to one side. If a lidding press is not provided the lidder nails first one end and then the other, the pressing being done by hand. It is sometimes necessary to settle the fruit packed in a lug with a high bulge by a jar or by a shaking movement before completing the nailing.

Some of the larger packing houses that handle a large volume of fruit are now equipped with electrically operated lidding machines such as is illustrated in figure 29. The operator in charge simply fits the lid in place over the fruit and presses a button with his foot and the machine does the nailing. Such labor-saving devices installed in packing houses where considerable volume is handled no doubt tend to cut down overhead costs.

LOADING THE CAR

Fresh tomatoes transported to market by rail are usually loaded in refrigerator cars. When loading a car the packages should be so arranged and the load so braced that it will not shift in transit, and the packages should be placed so as to permit free circulation of air.

California lug boxes, which comprise the bulk of the shipments by rail, are loaded five rows wide when placed crosswise of the car or six rows wide when placed lengthwise, and usually five or six layers

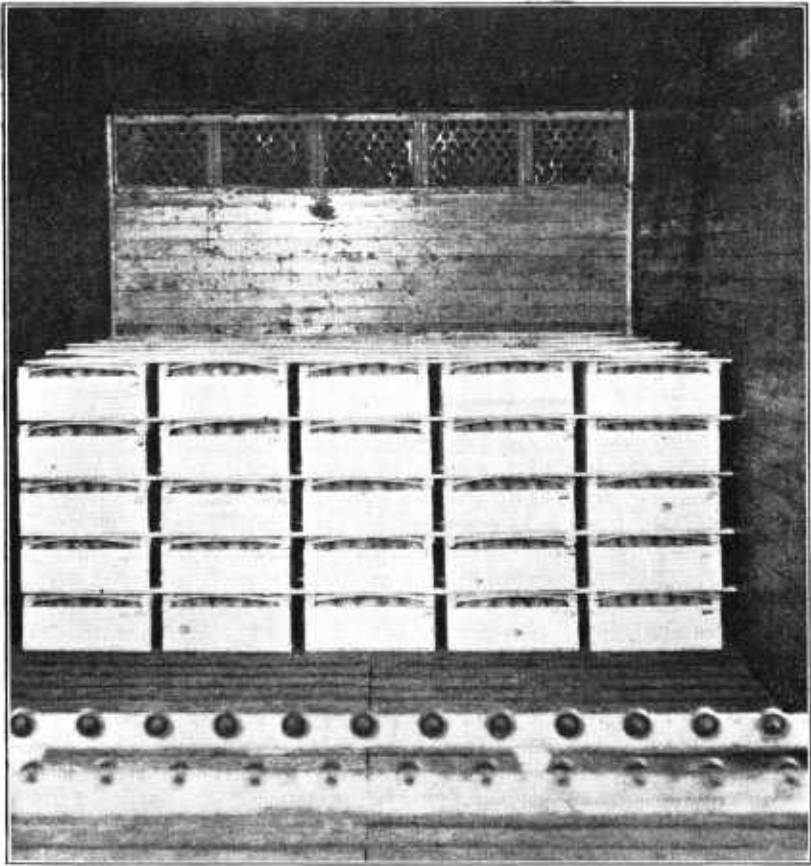


FIGURE 30.—Lug boxes are loaded in refrigerator cars five rows wide when placed crosswise or six rows wide when placed lengthwise of the car, and usually five or six layers high. Each layer of lugs is double stripped with the end of one strip butting against one wall and the end of the other butting against the opposite wall.

high. Cars loaded with lugs placed lengthwise will usually have 20 or 21 stacks, while those loaded with lugs placed crosswise will generally contain 24 to 26 stacks, depending upon the length of the car. Figure 30 shows a car in the process of being loaded with lugs stowed crosswise. Five-layer loads usually have from 600 to 660 packages to the car while six-layer loads may have from 720 to 780 packages.

It is usually necessary to brace the load in the center between the doorways of the car for, as a rule, the stacks will not just fill the lengthwise space. Sometimes excess space is taken up by the use of end bulkheads in one or both ends of the car. Stripping of each layer in each stack is also necessary to insure holding the load intact.

When the lugs are to be placed crosswise of the car the load is started by placing five lug boxes tightly against the bunker wall in one end, leaving equal spaces between the packages and also between the packages and the outside walls. If the lugs are to be loaded lengthwise the procedure is the same except that six lug boxes are spaced equally across the width of the car. When the layer is in place it is ready for stripping. The car strips should be made of good-quality lumber, preferably 1 inch but not less than $\frac{1}{2}$ inch thick by 1 inch in width and about 8 feet long. Two strips are placed across the layer about 1 inch from the edge of the lugs, with the end of one strip butting against one wall and the end of the other strip butting against the opposite wall (fig. 30). The strips should be nailed with one nail in each package. The stack is completed by placing additional lugs directly above those already in place and stripping each layer in the same manner as the first. The other stacks are then stowed by placing each lug box directly in front of those in the first stack. As each stack is stowed it is advisable to place a board in front of each tier of lugs and tap it lightly in various places with a small sledge hammer. This action will assist materially in maintaining a tight load. The opposite end of the car is loaded in a similar manner. If the boxes do not entirely fill the lengthwise space in the car the load must be center braced.

Many shippers use a standard type of center bracing consisting of two gates which fit against each face of the load. Each gate consists of five uprights held together by two crossbars. The uprights are made of 2- by 4-inch lumber, two of which reach to the ceiling of the car. As many cross pieces of 1- by 4-inch material as there are layers of packages are nailed across the uprights so as to be against the middle of the crates in each layer. Three spreaders of 2- by 4-inch dimensions cut slightly longer than the space between the uprights are wedged and nailed between the uprights on each gate to lock the bracing.

Six-basket carriers are usually loaded 7 rows wide and 4 layers high with about 15 stacks, but variation in loading and different lengths of cars may account for a range of about 340 to 550 packages per car. The usual loading for four-basket flats is 6 rows wide and 9 or 10 layers high with about 16 stacks in the car. The total number of packages per car may vary from about 840 to 1,232. The loads are generally center braced similar to that described for bracing of lug boxes.

Although tomatoes packed in Climax baskets largely move to market by truck some are shipped in refrigerator cars. The number of baskets per car may vary from 700 to 1,000, depending on the method of stowing. The load generally extends through the full length of the car and is 11 rows wide and 4 or 5 layers high. In Ohio, however, the cars are usually loaded with only one layer between doorways sloping to five layers high in the ends.

Eight-quart baskets which are sometimes shipped by rail are loaded with 1,200 to 2,500 packages per car. The average car is likely to have from 1,500 to 1,800 packages.

GRADES AND INSPECTION

Wholesale trading in fresh tomatoes is largely conducted on the basis of the United States standards. Standards for field-grown tomatoes were first issued in 1922, and in 1933 standards for greenhouse tomatoes were established. The standards define in detail



FIGURE 31.—Licensed inspector examining the tomatoes in a packed lug. A large percentage of the carlot shipments of tomatoes are inspected at shipping points by licensed Federal-State inspectors, who issue certificates showing the grade, quality, and condition of the tomatoes in the cars.

the requirements of the various grades and packs and prescribe the markings that should be shown on the packages. Copies of these standards are available for distribution by the Agricultural Marketing Service, United States Department of Agriculture.

The Federal-State inspection service at shipping point is available in practically all of the important commercial tomato-producing areas. Licensed Federal-State inspectors will inspect a shipment for a small fee and issue a certificate showing the grade and size of the fruit together with other facts such as the type of pack, kind of containers used, and method of loading (fig. 31). Federal inspection is also available in the larger markets and the territory adjacent to them.

There were 12,280 carloads of tomatoes inspected at shipping points during the calendar year 1935 which was approximately 52 percent of the total carlot movement.

The general use of standards by growers and shippers has many advantages. As a basis for trading their use tends to establish confidence among buyers and sellers which helps to widen the market. The standards serve as a common language between the shipper and the distant buyer and provide a basis of quoting sales which is generally understood throughout the industry. Inspection at shipping point under established standards tends to prevent unjustified rejections at destination in the case of sales made f. o. b. usual terms. Better production methods among growers are encouraged by the use of standards as produce of the higher grades usually sells for a premium in price over that of the lower grades or field-run fruit. The presence of large quantities of poor-quality and ungraded tomatoes on the markets adversely affects the sale of good quality stock.